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and **REHABILITATION**

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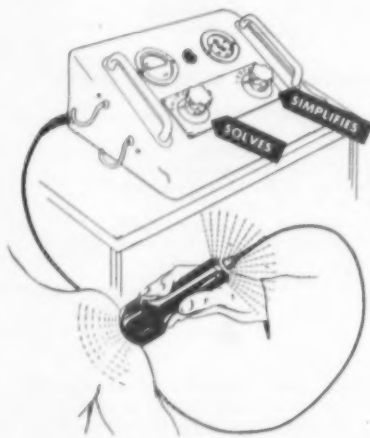
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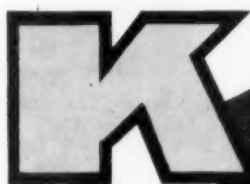
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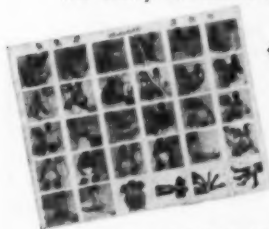
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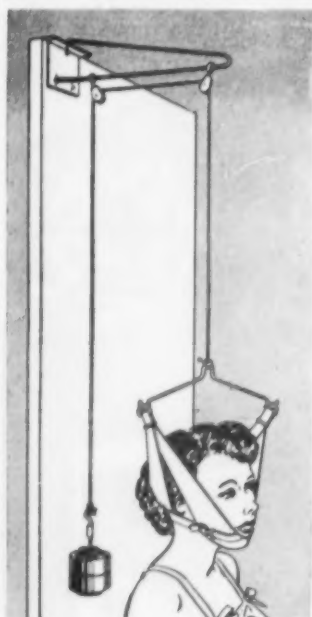
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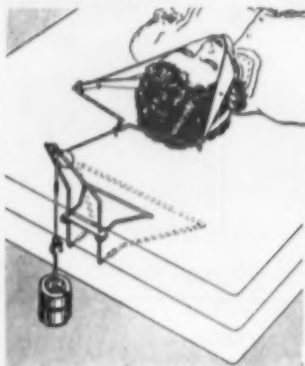


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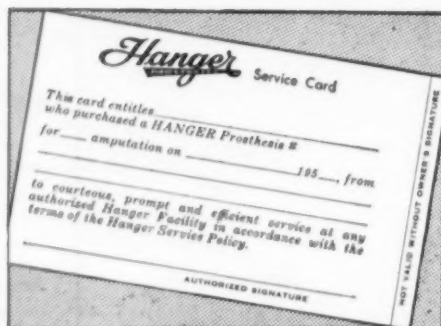
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Classification and Treatment of Early Lateral Deviations of the Spine Following Acute Anterior Poliomyelitis

Robert L. Bennett, M.D.
Warm Springs, Ga.

Of all the skeletal deformities following acute anterior poliomyelitis, scoliosis constitutes the most serious threat to functional activity and to life itself. Its causes are many, its early recognition is difficult, and its correction after structural changes have taken place is impossible. Despite these discouraging facts, it is quite possible to prevent the development of significant structural scoliosis in most, if not all, instances.

The only possible means of preventing a scoliosis is to eliminate all factors that would persistently cause the spine to deviate laterally. This statement has little significance and might be considered so obvious as to be unnecessary unless it is realized that the causes that lead to eventual structural scoliosis are present or may be anticipated long before clinical or x-ray evidence of a significant curve is seen. It is perfectly logical to emphasize that if a scoliosis is to be prevented, the physician must be constantly anticipating, searching for, and treating all factors that could possibly bring about persistent, faulty alignment of the spine. Each severe structural scoliosis began as a mild and usually intermittent deviation from normal alignment. As the deviation, regardless of cause, became more persistent, secondary changes took place in the tissues supporting the spine. General bodily patterns of activity were adapted to the persistent faulty position of the spine, and eventually, irreversible structural distortion occurred.

It would be foolish to believe that all factors in every case could be completely controlled, but it is certainly not

foolish to believe that early recognition and care affords the only real hope for prevention or at least control insofar as is humanly possible.

Careful consideration reveals that there are many reasons for persistent, faulty alignment of the spine during the acute and convalescent stages of poliomyelitis. These causes may occur singly or in multiple combinations. Not all of these causes are of equal importance, but it must be emphasized that whatever the cause or causes, persistent lateral deviation of the spine will eventually result in some degree of irreversible structural changes.

The following is a list of factors that most commonly cause or accelerate the development and progression of the various types of scoliosis that follow poliomyelitis. An attempt is made to list these factors in the order of their importance, but much more experience will be required to list these with assurance. It is believed that those heading the list can of themselves cause significant structural scoliosis unless they are recognized early and can be quickly controlled. Those at the bottom of the list acting singly are not likely to cause significant structural changes in the spine. However, they can be serious accelerating factors when acting in combination with the more specific causative factors:

1. Primary disturbances in vertebral growth centers, and pre-existing congenital faults. It must be admitted that, if asymmetrical disturbances in growth centers (epiphyseal and/or apophyseal) of vertebrae occur as a *primary* effect of the *acute* disease, nothing known at the present time can alter the development of some degree of scoliosis. The control of this primary scoliosis will then depend

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Medical Director, Georgia Warm Springs Foundation, Warm Springs, Ga.; Professor, Emory University School of Medicine, Emory University, Ga.

on the site and extent of the damage and our ability to align the spine in safe compensation above and below these irreversible growth defects. How frequently these primary growth changes take place in the spine following poliomyelitis is not known. It would appear more reasonable to believe that persistent stress placed on the vertebrae by extraspinal disturbances are a more common cause of local distortion of vertebral contour resulting in secondary lateral deviation and rotation.

2. Weakness and/or contracture of intrinsic spinal musculature.
3. Changes in length and resilience of periarticular supportive tissues.
4. Abdominal muscular weakness (*asymmetrical involvement is of particular importance*).
5. Weakness and/or contracture of extrinsic spinal musculature. (Quadratus lumborum, ilio psoas and latissimus dorsi are most important).
6. Weakness of sternocleidomastoid (*asymmetrical*).
7. Flexion-abduction contracture of hip (*asymmetrical*).
8. Shoulder girdle weakness (*asymmetrical*).
9. Loss of muscle bulk at hip and thigh (*asymmetrical*).
10. Difference in lower extremity length.
11. Miscellaneous: Faulty habit patterns, dominant handedness, differences in vision, hearing, etc.

By clinical and x-ray visualization, lateral deviations of the spine seen early appear to fall into four basic forms. These forms occur so frequently alone and have such individual characteristics, particularly as related to their future progression, that they may be said to be distinct types. In this discussion, they will be designated as Types I, II, III, and IV. This order of listing does not refer to frequency or to future significance but is an arbitrary listing of the curves beginning in the lumbosacral region and extending upward to the high dorsal region.

The various types discussed are not always found in pure form. Any combination and degree of individual types may co-exist, but an understanding of the pathogenesis and significance of the individual type enables us to analyze more reasonably the various combinations that occur. This must be thought of as an approach to early recognition of persistent spinal deviation so that a better understanding of the pathogenesis of structural scoliosis may be gained. Only in this way can the incidence and severity of structural scoliosis be lessened.

In my own experience, structural scoliosis has not yielded to conservative care. When compensation has occurred and the progression of a scoliosis ceased, I have but infrequently been able to say that braces, corsets, exercises or stretching were the deciding factors. By far the greater number of structural curves stopped progressing simply because of a fortunate combination of age, weight, activity and good luck. This does not detract in any way from good and intelligent care, but it does indicate the limits of such treatment once structural changes have occurred. Good care may be able to affect compensation, but compensation is a poor compromise to prevention.

Type I

This type (fig. 1, 1A, 1B) occurs in the lumbar region and is characterized by lateral tilting or shifting of L 5 on S 1, or L 4 on L 5, or both. This faulty lateral take-off in the lumbosacral region can be detected early by clinical examination revealing unilateral loss of mobility (or unilateral excessive mobility) in the lumbosacral region, and by x-ray confirming the lateral deviation. In my own experience, I have not been able to detect early, mild changes until I could examine and x-ray the patient in a sitting position. The cause of this faulty take-off is not always apparent even after thorough clinical and x-ray examination. Underlying congenital defects are frequently found in this region. Of the eleven causative factors already mentioned, the first five may be causative

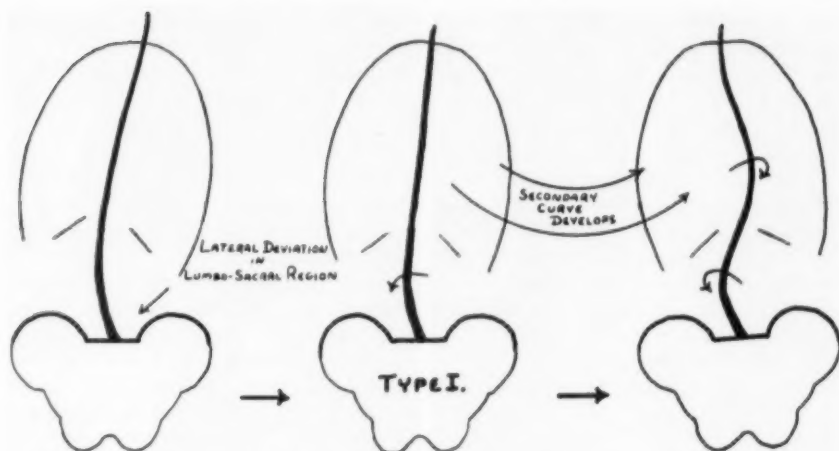


Fig. 1, 1A, 1B — Type I deviation showing faulty lateral take-off in the lumbosacral region, and the frequent development of a secondary dorsal curve.

either acting singly or together. Of the accelerating factors, asymmetrical contracture of the iliotibial fascia and unilateral loss of bulk in hip and thigh are most troublesome. Unfortunately, these latter accelerating factors can exist on one side or the other with equally severe effect on the lumbosacral alignment.

Gradual increase in the primary lum-

bar curve and the development of secondary curves are to be expected. Treatment consists of early recognition, specific stretching of the iliolumbar region on the side of the acute lateral angle, and restriction of sitting and standing positions. No corset, jacket or back brace is of any real value in preventing the progression of the primary curve in the



1A



1B

lumbar region, but may minimize the development of the secondary curve in the dorsal region. Of particular importance is the early release of iliotibial fascial contracture. It is important to note that a gluteal pad should not be used until the iliolumbar region is mobilized and never without x-ray examination of the sitting spine to determine the effect of the gluteal pad on the lumbosacral angle. The danger lies in the possibility that the gluteal pad will simply increase the basic problem by lifting the hip and further closing the lumbosacral angle on that side.

Type II

This type (fig. 2, 2A, 2B) occurs in the mid or upper lumbar region and has three characteristics, all of which must be present before this type can be so designated: First, a normal vertical alignment between the lower lumbar and sacral segments; second, a tilting of the pelvis downward on the side of the convexity of the curve, and third, simple correction by leveling the pelvis. Loss of bulk in the gluteal and thigh muscles is the most common cause. Persistent over-

use of unilateral strength in quadratus lumborum or lateral abdominals are as important, but less frequent, causes. Later, a discrepancy in leg length will act in the same way when the patient is standing. Occasionally soreness in the buttocks or tightness of the iliotibial fascia will cause the patient to sit with a high hip on the side of the soreness or tightness.

Any method of leveling the pelvis in the sitting or standing position will correct the curve. It is the only type in which a gluteal lift, or a shoe lift, may be used without danger. This type is but infrequently followed by significant structural changes. Its real danger lies in its ability to accelerate a Type III curve.

Type III

This type occurs in the dorsolumbar region and can be arbitrarily divided into sub-types, III-A and III-B, to designate the maximum convexity in relationship to the dorsolumbar junction.

Type III-A (fig. 3, 3A, 3B) is characterized by a long "C" curve with maximum convexity at or just above

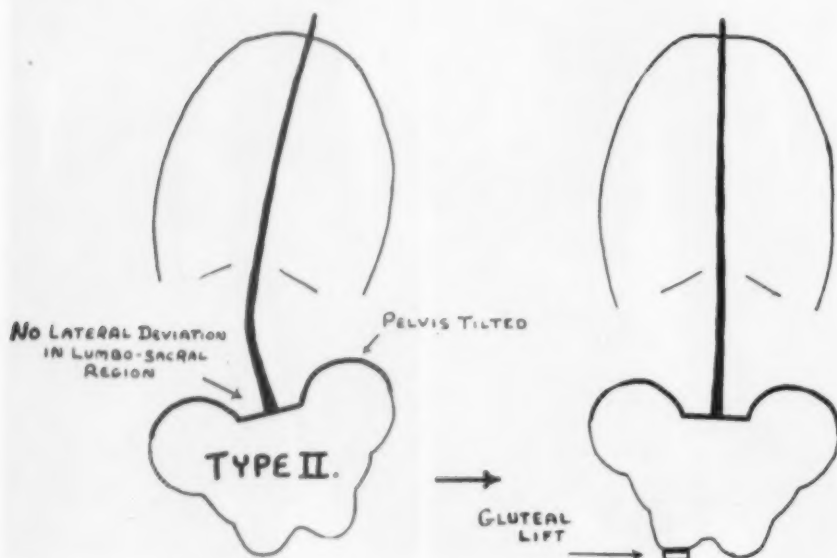


Fig. 2, 2A, 2B — Type II deviation showing the tilted pelvis, normal take-off at lumbosacral junction and correction by leveling the pelvis.

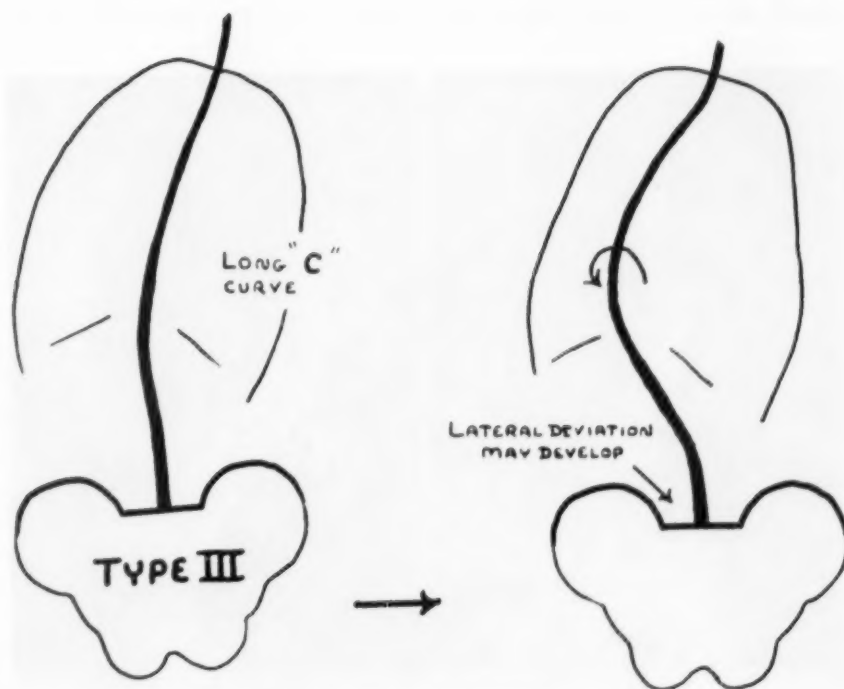
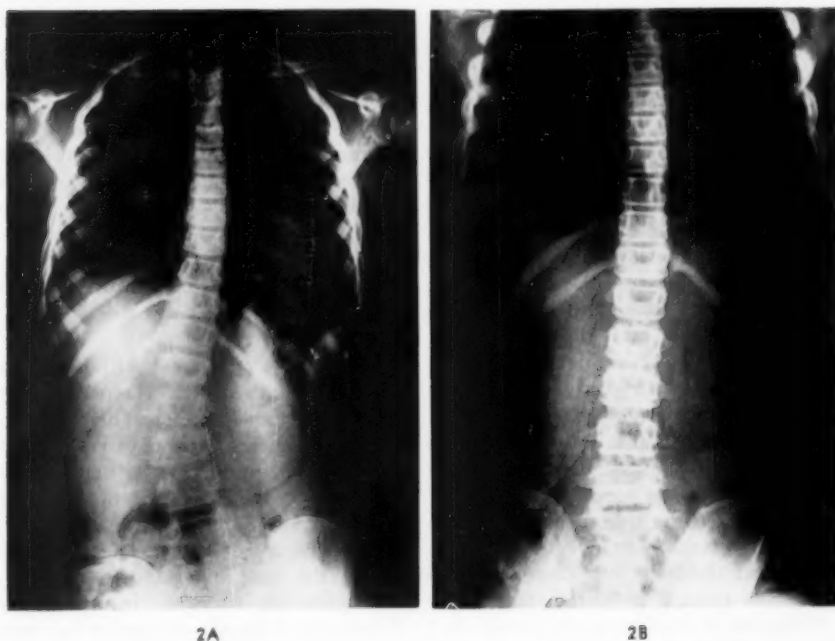


Fig. 3, 3A, 3B — Type III-A deviation showing long "C" curve and usual progression.

(D 10-11-12) the dorsolumbar junction. This curve is caused by diffuse, moderate to very severe weakness of all of the musculature supporting the middle and lower back. This is frequently called a "weak trunk curve." The back simply falls into this position when weight bearing because it has insufficient musculature to support it in a normal manner. This curve can be aggravated and modified by any of the causative factors listed, and irreversible structural changes take place rapidly in and about the spine. Later, secondary curves develop in the lumbosacral region and high in the dorsal spine and may progress rapidly.

Treatment consists of early recognition, restriction of weight bearing (sitting or standing), specific stretching of the tissues on the side of the concavity, and symmetrical strengthening of the back and abdomen in a corrected position. No general mobilization either in the lateral or anteroposterior planes must be permitted except as is necessary to initiate symmetrical muscle re-education of the back and abdominal groups. This should not exceed twenty degrees for-

ward flexion and ten degrees lateral motion unless both muscle strength returns and normal alignment of the spine is restored. A well fitted corset with the posterior stays re-enforced by horizontal aluminum bars at top and bottom is the preferred spinal support because it can be adjusted easily and repeatedly as the progress of the spinal alignment demands. Support of the middle back requires the use of simple crutch attachments to the corset.

Type III-B (fig. 4, 4A, 4B) is a more angular curve with maximum convexity high in the lumbar region. The malalignment is on the basis of asymmetrical balance and use of muscles that control position of the lower portion of the thorax and its relation to the pelvis. Asymmetrical weakness in the abdominal wall is the most important single factor. Asymmetrical strength in quadratus lumborum is equally important but seen less frequently. When this is coupled with weakness in the intrinsic musculature of the spine, the progress of the curve is rapid. Even though the patient



3A



3B

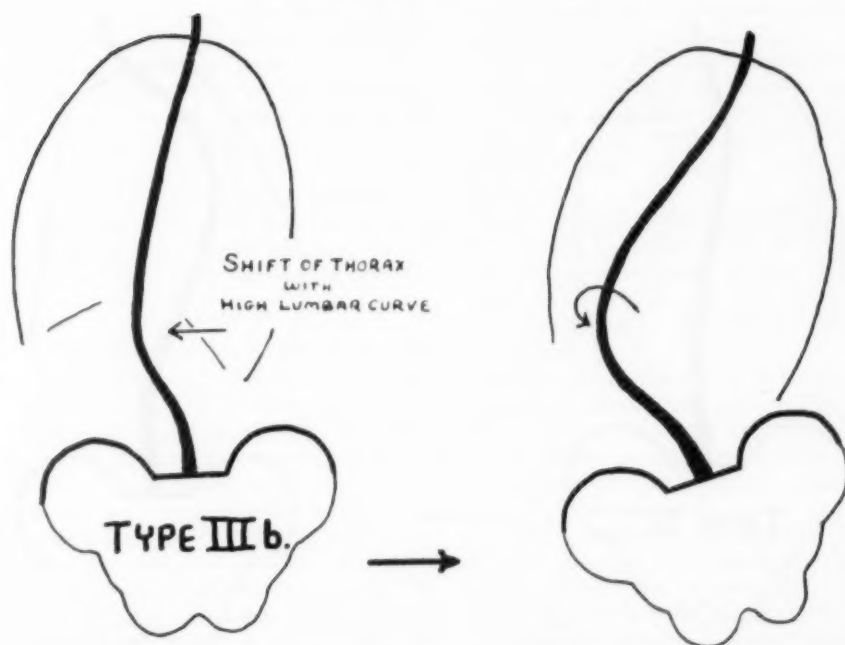


Fig. 4, 4A, 4B — Type III-B deviation showing the angular high lumbar curve with usual progression.



4A



4B

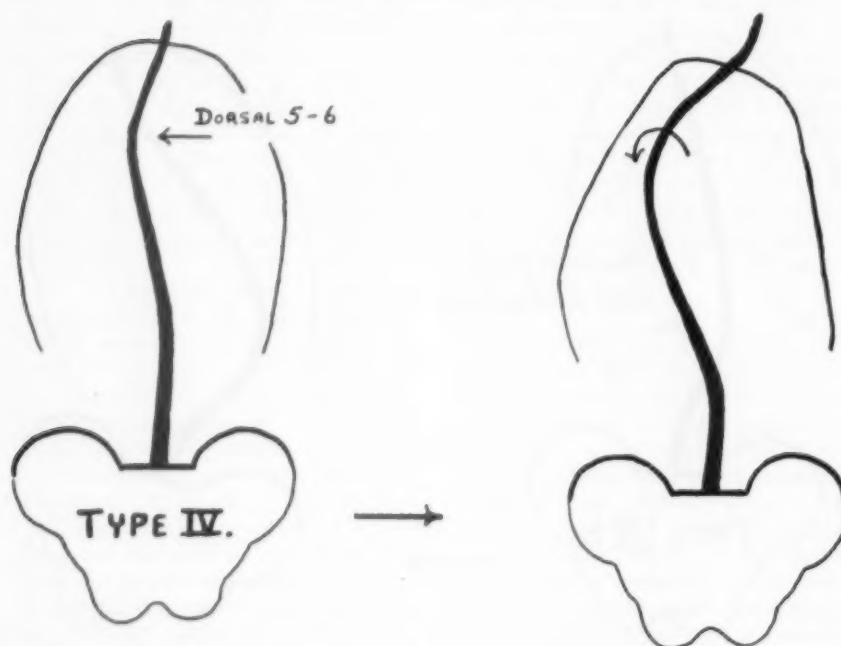


Fig. 5, 5A, 5B — Type IV deviation showing characteristic angular curve at D 5-6.



is not permitted to sit or stand, every movement in bed brings into play the asymmetrical use of the abdominals and/or quadratus lumborum, increases not only the curve but the actual imbalance itself. This is aggravated in the sitting or standing positions.

The treatment is the same as for Type III-A, but more rigid positioning and limitation of activity must be enforced while specific muscle re-education attempts to balance the abdominal wall.

Type IV

This type (fig. 5, 5A, 5B) occurs high in the dorsal region at the level of D 5 or D 6. It is characterized by an acute angulation at this level with long, smooth compensatory curves above and below. This curve is very difficult to discover early because it occurs in a relatively rigid portion of the spine and thoracic cage, and its onset is slow. It occurs most frequently in patients with loss of upper thoracic respiratory excursion but mobile lower thorax. It is markedly aggravated by asymmetrical loss of the sternocleido-mastoid, upper trapezius and shoulder girdle. It is less aggravated by asymmetrical involvement of the serratus anterior, rhomboids, or middle and lower trapezius. It progresses into a kypho-scoliosis with unsightly lateral shifting and forward positioning of the head in relationship to the shoulders and thorax.

The treatment is based on early recognition, restriction of weight bearing, support of middle and upper back and application of suitable traction apparatus. No type of corset or back brace without head traction can effectively support this type of curve. Specific manual stretching of this region is very difficult and of limited value.

It is beyond the scope of this discussion to outline the specific care of each

type of curve in further detail, but the following are additional important points in early care of spinal alignment:

Asymmetrical tightness or excessive asymmetrical mobility of the spine are the earliest signs of incipient scoliosis.

Specific stretching of contractures influencing spinal alignment must be started early.

Early anteroposterior mobilization of the spine is dangerous unless the trunk musculature is of good strength. Symmetrical tightness in the back should be permitted if severe underlying weakness is apparent.

No activity in the sitting or standing position should be permitted unless good alignment of the spine can be maintained. Early use of a corset may be necessary to permit safe activity even in the lying position.

Anteroposterior visualization by x-ray of the patient in the sitting position should be obtained as soon after the acute stage as possible. X-rays should be repeated frequently (every 3 or 4 months) until child is fully grown.

Summary

Conservative methods of care are incapable of correcting the structural scoliosis following acute anterior poliomyelitis. Prevention of significant structural scoliosis is possible, but can be achieved only through early recognition and control of all those factors present in the individual patient that could cause persistent, faulty alignment of the spine. The four basic forms of lateral deviation seen early are important to recognize because they alert the physician to the danger of progressive scoliosis; they give a clue to the most probable causes of the lateral curvature, and they indicate the specific routines of treatment necessary to correct the curve, or at least minimize its progression.

Use of Speech Therapy in Physical Medicine

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Human speech is made possible by the proper integration of highly complex neuromuscular actions extending from the head to the pelvis. The majority of these activities are regulated by reflex patterns whereas the guidance of the motor behavior is controlled by the cerebral cortex and neural mechanisms associated with mentation and voluntary motion. The inability to speak constitutes one of the most severe disabilities of mankind for it eliminates the chief means of communication with fellow-men. The clinical conditions commonly encountered in physical medicine that include speech defects are: cerebral palsy, multiple sclerosis, hemiplegia, bulbar and bulbo-spinal anterior poliomyelitis, congenital speech defects, facial paralysis, brain hemorrhage and injury, speech defects following brain surgery, and speech abnormalities such as stuttering, delayed speech, cleft palate, articulation defects and sound substitution, poor speech habits, faulty enunciation, monotonous expression of spoken language, and deafness. Unfortunately only a few of those afflicted with the more common speech abnormalities seek the services of physical medicine for assistance in the correction of such disabilities. This is largely due, in our opinion, to the fact that the public does not know that physical medicine is prepared to treat individuals with speech disorders and in particular, those of neuromuscular origin.

A pleasant, well-trained speaking voice in meeting the public has become a vital prerequisite of executives in busi-

ness management. Telephone companies, as an example, include voice training as an essential in their indoctrination program for telephone operators. A pleasant and friendly voice is the mark of a good stewardess in our national airlines. Those who have engaged in the field of radio, motion pictures and the theatre have long been aware of the power of correct and pleasant speech. Television has provided a signal impetus to the necessity for good voice training. The insistence of employers that good voice training on the part of personnel who are in daily contact with the public has become in fact a recognized essential of good business practice. The importance of this attitude on the part of the employer constantly confronts those of us who are engaged in vocational rehabilitation. It becomes frequently necessary that a handicapped individual be trained in some type of vocation requiring ability to speak well to enable him to make a living. This vocational need, by itself, is sufficient grounds for providing a comprehensive speech therapy department as a necessary professional service in a physical medicine and rehabilitation center. It becomes the responsibility of those engaged in physical medicine to inform the general public that our specialty stands ready to provide such a service for the correction of minor or major speech disorders.

Principles of Speech Production

The principles of speech production are found primarily in physics, anatomy, and physiology. These are combined into the science of language and the addition of the art of vocal usage (expression) constitutes speech. In physics the principles are concerned largely with tone, that is, the wave forms which produce tones of various kinds, and the

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mechanism of producing and modifying tones.

The major portion of the energy utilized in speech is supplied by the respiratory muscles. The neuromuscular integration of contraction and relaxation of the respiratory muscles, such as the fixation muscles of the neck, the intercostal muscles of the chest, the diaphragm, and the abdominals causes pulmonary ventilation by means of rhythmic inspiration and expiration and consequently an adequate air flow through the speech structure.

Human speech, from the point of view of combined principles, may be regarded as a series of voiced sounds interspersed with voiceless speech sounds. The valve action of the soft palate regulates the use of the nasal cavity as a resonator for the production of nasal tones. In the production of consonants, articulation is accomplished by the proper positioning and firmness of contact between the two lips, the lips and the teeth, and between the tip and blade or dorsum of the tongue at various points along the roof of the mouth extending from the teeth to the velum. The integration of the neuromuscular control of the lips, cheeks, tongue, soft palate, and pharynx determines the accuracy of articulation.³

Voice Science

Authorities in the field of voice science^{4,7,8} divide vocalism into the following categories: 1) Respiration; 2) phonation; 3) resonance, and 4) articulation. In general it may be said that speech is a highly skilled activity which has been acquired as an overlaid function using the more primitive mechanisms of breathing and eating. It is readily understood, therefore, that speech is intimately concerned with respiration, mastication, and deglutition. Neuromuscular re-education of speech abnormalities, therefore, must concern itself with the functions of the structures involved in breathing and eating. Other phases of activity are those concerned with association and sensory centers which

regulate emotional and mental (memory, sensory, and motor activity) aspects of speech. These association and sensory areas are integrated with the corticospinal system which provides motor control of the musculature of the speech mechanism through the brain stem, spinal reflex centers, and peripheral nerves concerned with the motor mechanism of speech.

Respiration: During quiet breathing, pulmonary ventilation is accomplished by enlarging the thorax principally in three diameters, the vertical diameter, the anterior-posterior diameter, and, to a lesser extent, the transverse diameter. If the increase in vertical diameter predominates, the breathing is referred to as "diaphragmatic" or abdominal breathing. If the anterior-posterior and lateral diameters predominantly increase, it is called costal breathing. Men, in general, principally employ abdominal breathing whereas women, for the most part, utilize costal breathing. In both sexes a mixture of chest and abdominal breathing is employed. The predominate feature in males, however, is abdominal whereas the dominant type in females is thoracic or costal. Shoulder fixation for the action of some of these accessory muscles is accomplished by phasic contraction of the trapezius, rhomboids, scaleni, and levator scapuli. These, in turn, are assisted by the muscles of the neck, namely, the posterior neck muscles and the sacrospinalis group of the thorax and lumbar region. Rhythmic opening and closing of the glottis is associated with inspiration and expiration in order to provide an easier passage for the air current. The respiratory muscles employed in forced expiration are brought into play by contraction of the rectus abdominals, the abdominal obliques, intercostals, iliocostalis, serratus posterior-inferior, and the latissimus dorsi.

Phonation: The phonetic elements of vowels, diphthongs, and consonants, and the non-phonetic elements of melody, quality, time and force are included in this division of voice science.⁹ These are divided into two major classes: 1) Vowels and diphthongs, and 2) con-

sonants. Vowels are relatively sustained, strong sounds. They are produced by vibration of the vocal bands in the larynx and transmitted through the pharynx and buccal cavities as simple or pure tones. The different vowel sounds are produced by altering the size and shape of the buccal cavity and lips. The tongue and lips play a most important part in determining a specific resonator chamber for each of the vowel sounds. Diphthongs are blends of two vowel sounds. They are produced by shifting the mouth channel from one vowel position to another while the sound continues as a glide from one pattern of resonances to another. The vowels are a, e, i, o, and u, and the diphthongs are w and y. Consonants have a common feature, namely, that the buccal cavity is either closed or formed into a more restricted passage than is used in producing vowels and diphthongs. Each consonant is characterized by a particular setting and usage of the speech organs. The structures employed in the formation of consonants are chiefly the lips, tongue, and soft palate. The position of these structures is determined by their nervous control which regulates the proper opening, closing, and positioning of the apertures, as well as regulating the size and configuration of the cavity.

Resonance: Resonance is produced by the vibration of air columns enclosed in the airway and the air contained in the resonating chambers. Ninety to ninety-five per cent of the selective reinforcement of the various harmonics are provided by the adjustable resonators. The neuromuscular control concerned in determining the size and the shape of the adjustable resonators is closely related to and intimately involved with the same mechanism which regulates articulation.^{1,7,8}

Articulation: Interruption of the breath stream at various levels along its path from the pharynx to the exterior constitutes articulation. Beginning from the lips backward we find points of interruption at the level of the lips, tongue and teeth, tip of tongue to the

roof of the mouth, middle of the tongue to the roof of the mouth, back of the tongue to the roof of the mouth, back of the tongue to the velum, and back of the tongue to the posterior pharyngeal wall, and at the glottis itself. Proper articulation by neural integration regulates the size and tension of the orifices, as well as the size, shape, consistency and sequential variation of the adjustable resonators.^{1,7,8}

Speech Therapy

Many patients with speech defects exhibit erroneous breathing habits which are frequently combined with excessive pharyngeal tension. These patients are found usually among the spastic paralyses, such as cerebral palsy, hemiplegia, multiple sclerosis, and primary speech disorders of various kinds. Treatment obviously should include exercises and training in proper breathing and in synchronizing breathing with talking, and by providing the necessary diaphragmatic support by contracting the abdominal muscles, and, to a lesser extent, the chest muscles. The purpose of this activity is to force the proper flow of air through the larynx. Relaxation exercises, both on a reflex and conscious voluntary level, are directed toward overcoming the hypertonus of the laryngeal muscles. Exercises of this type are used to produce good basic tone qualities, to which may be added speech sounds, words, and phrases in order to develop coordinated contractions and relaxations of the articulatory organs. Repetition and training exercises which combine respiration, phonation, and articulation are employed in sequence as the patient improves. Somewhat the same approach is applicable to patients with lower motor neuron types of paralyses, particularly those having bulbar and bulbo-spinal anterior poliomyelitis. Since the primary consideration of training in any of these conditions is dependent upon the neuromuscular control of the regional somatic structures, neuromuscular re-education of these structures is of prime importance. The basic principles of the treatment of par-

etic and paralyzed muscles of the trunk and extremities, as employed at the California Rehabilitation Center, are those of neurophysiology. They are employed also in speech therapy for the treatment of the muscles of the face, tongue and cheeks, and for the muscles of mastication, deglutition (tongue, velum, pharynx, and larynx), the laryngeal structures for phonation, and the respiratory structures for controlled breathing and respiration. They have been found to be equally efficient in the treatment of neuromuscular abnormalities of speech organs. These principles depend upon resistive exercises and reinforcement consisting of the use of maximum voluntary effort exerted against a strong external resistive force. Manual resistive exercises for the muscles of the trunk, chest, neck, larynx, throat, mouth, and face are used to develop power, control, coordination, and muscle balance. Special techniques are employed to produce synaptic facilitation.⁴ These are based on stretch reflexes, postural reflexes, spatial summation, irradiation, spinal induction, central excitation, and central inhibition. Special speech instruments, as designed by Kabat and associates, are used to provide resistive exercises for the tongue, cheek, and lips. Blow bottles of different sizes are employed to produce resistive exercises for the lips, cheeks, palatal, tongue, mouth, and breathing muscles. The resistive exercise instruments for the tongue are shown in figure 1 and an illustration of the Blow Bottles is shown in figure 2.

The techniques for developing maximal synaptic facilitation, with the resultant reinforcement of reflex and voluntary contraction of the involved muscles, have been described adequately in articles by Kabat.^{5,6} The techniques we employ in speech therapy are as a rule those of unilateral, bilateral symmetrical and bilateral asymmetrical exercises of the muscles of the face and neck; unilateral and bilateral resistive exercises of the cheek and tongue; unilateral and bilateral exercises of the muscles of mastication; bilateral, resistive exercises

of the muscles of the floor of the mouth, and of the muscles that control elevation, depression, and lateral stabilization of the larynx. These are manual exercises which may be reinforced by simultaneous contraction of muscles of the shoulder girdle or by muscles of mastication, facial muscles, and regular or accessory respiratory muscles. The muscles of the thorax are usually treated by employing either isotonic or isometric contractions of the muscles of the neck and thoracic cage, reinforced by contraction of either the anterior or posterior neck muscles and/or by muscles of the shoulder girdle, arm, and forearm using either unilateral or bilateral motion pattern exercises. The abdominal muscles may be re-educated by using local manual-resistive exercises, or by combining resistive exercises of the chest and reinforced by flexion or extension muscles of the neck, or with the lateral neck muscles, which may be combined with shoulder and lateral trunk muscles. Most commonly, however, the abdominal exercises are carried out by bilateral, asymmetrical, diagonal spiral exercises of the upper extremity carried through the full range of motion extending diagonally across the body from full flexion to one of full extension of the shoulders and return. These exercises are performed in a supine position with the patient lying on the treatment table. The techniques usually employed are those of contraction-hold, slow-reversal, rhythmic stabilization, or slow-reversal hold contractions.

Voice training is given concurrently with neuromuscular re-education or is started soon afterward, and is concerned with the development of speech timbre, volume, and expression. The rehabilitation of the aphasic patient is based upon utilization of all sensory avenues available for the establishment of communication, including many of the exercises and techniques employed in the neuromuscular re-education and training of other paralyzed patients. This principle applies particularly to the treatment of motor aphasia, which is concerned with the expressive aspects

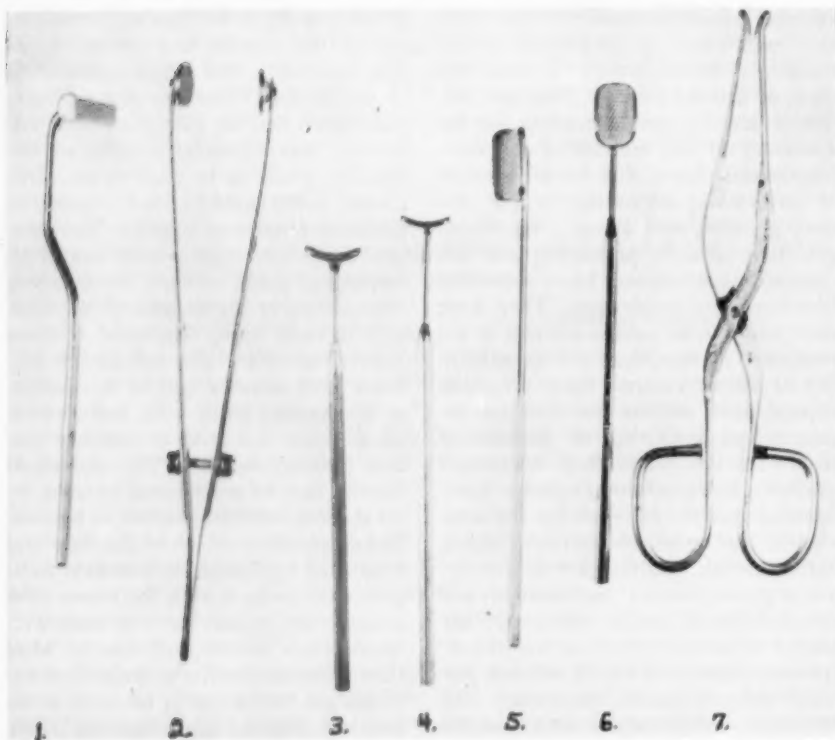


Fig. 1 — Speech therapy instruments—resistors employed in providing resistive exercises: 1. Tongue elevator resistor; 2. tongue retractor resistor; 3. large protruder resistor; 4. small protruder resistor; 5. lateral tongue resistor; 6. small lateral tongue resistor, and 7. buccinator resistor.



Fig. 2 — Illustrating the use of Blow Bottles for improving the power and control of facial, pharyngeal, and respirator muscles. 1. Set of large Blow Bottles, tubing, and mouth piece, and 2. set of small Blow Bottles, with rubber tubing and glass tubing connections.

of language, whereas sensory aphasia is concerned principally with the perceptive aspects of aphasia—emphasis is placed upon sensory and psychological training. The emphasis in the treatment of motor aphasia patients is based upon bilateral, symmetrical exercises, voice training, spoken and written word recognition, and the repetition of word, phrase, and sentences, either written or spoken, the recognition and naming of familiar objects or pictures of familiar objects, and eventually training in the formulation of sentences and ideas that express themselves in conversation or in writing. Visual and auditory approach is utilized extensively in order to redevelop memory and mental capacity which will enable the patient to set his speech mechanism into operation in order to express his ideas and thoughts accurately.

Case Reports

Illustration of the types of patients treated and the results obtained are presented in the following case histories.

Case 1: A.S., #1806, age 21, female, single. Diagnosis: anterior poliomyelitis, paralytic, bulbo-spinal type, severe, involving the face, tongue, jaw muscles, muscles of swallowing, and weakness of the trunk muscles and paralysis of the muscles of both lower extremities. Onset of her illness was August 16, 1951, while visiting in Oklahoma City. Patient's home is in Oregon. She was treated at the University Crippled Children's Hospital in Oklahoma City for four months and was subsequently treated at the Holiday Park Hospital in Portland for six months. Her initial symptoms were those of headache, nausea, diarrhea, difficulty in swallowing. Her jaw receded, her speech was lost, she developed a paralysis of her chest, trunk, and lower extremities, and had a tracheotomy performed, which she used for nine months. She began to use a wheelchair six months after the onset of her illness and began using braces in twelve months and crutches in fourteen months. She began to walk unassisted in fourteen months. She was transferred from home to the Kabat-Kaiser Institute, now the California Rehabilitation Center, on November 23, 1952. Physical findings were those of a paraplegic who had learned to walk with the aid of braces and crutches but who used a wheel chair most of the time to get around. She was unable to eat solid foods and had to be fed a specially prepared liquid diet by means of a Levine tube. She could not close her mouth at any time by herself except when she used her hand to close it. She drooled constantly because of her facial paralysis and an inability to swallow. A divergent squint of the left eye was noted and there was a tendency toward diplopia. She was placed on a program of speech therapy, neuromuscular re-education, mat exercises, pulley exercises, and pool therapy. At the beginning it was impossible to understand anything the patient attempted to say. Speech therapy progress notes show the following: The patient was hospitalized ten months before admission to the California Rehabilitation Center and treated for a total of sixteen months. When speech therapy was started the patient showed a complete right facial paralysis. She was unable to move the tongue laterally, protrude, or spread the tongue. The jaw was severely involved. She was unable to close the jaw, move it laterally, protrude or retract the jaw, or move the

mandible in any direction. The teeth were poorly aligned. All food had to be prepared in a blender and fed by Levine tube. The patient drooled constantly. The extent of involvement was so severe that it was necessary to limit the field of concentration and set a goal of primitive functional return for the first few months. Treatment of the tongue involvement consisted of stretching and passive movement throughout the range in all directions, resistive exercises consisting of protrusion, lateral motion from side to side, and elevation of the tongue in various segments. Patient supplemented this treatment by stretching her tongue herself whenever she could. Speech instruments, gauze squares, and tongue depressors were employed to assist in the passive and resistive exercises. Treatment of the jaw consisted of resistive exercises, using neuromuscular re-education patterns. Home work for this patient entailed practice chewing pieces of sponge and gradually decreasing the size of the pieces as some of the ability to contract the masseters returned. During the first few months the patient made definite gains in the control of drooling, as evidenced by the decrease in the number of boxes of Kleenex patient used. At first it was necessary for her to use a box every twelve hours. This was reduced in a few months to one box every four days. The patient began to chew soft solids the fourth month after treatment started and, at the present time, the patient is home on vacation and no longer needs the blender to prepare her food. The facial paralysis is still severe though some return is starting in the orbicularis oculi and alar nasi. Treatment of the facial muscles included electrical stimulation, mobilization therapy (using the Percussomotor), bilateral resistive exercises, and reinforcement exercises for the muscles of mastication. Articulation exercises were motivated as much as possible. There has been some improvement in articulation, as it is now possible to understand most of what she says. Her respiratory mechanism and phonation is essentially normal. Patient has shown slow but measurable improvement in her ambulation, swallowing, feeding, and in her facial paralysis. On August 25, 1953, a visual survey test was made, at which time it was found that there was a decided muscular weakness for both vertical and lateral movements of the eyes. To avoid seeing double, the patient has started to suppress her left eye. She has very poor depth perception and orthoptic training of the eye muscles is recommended. She had no history of visual difficulty prior to polio. Patient has shown marked improvement in ambulation, swallowing, and speech.

Case 2: J.A., #1908, age 31, male, single. Diagnosis: hemiplegia, post-operative following surgical removal of brain cyst and old blood clot, aphasia. Onset April 8, 1948 and was admitted to Kabat-Kaiser Institute on March 3, 1953. The patient suffered a severe head injury from an automobile accident in April, 1948. Six brain operations were performed to remove the clot. Multiple brain abscesses and a cyst developed which damaged areas of the brain in the left parietal and temporal areas extending to the base of the brain. Large areas of the brain were removed and others were spared, though damaged. Patient has shown consistent improvement in speech during the five months of treatment at the Kabat-Kaiser Institute (now the California Rehabilitation Center). He has a hearing loss of central type which has improved. He also had a past history of hearing difficulty even before his accident. Hearing loss is compensated, in part, by wearing a hearing aid. This difficulty has been further reduced by teaching the patient to lip read. At the beginning of treatment the patient had a telegraphic type of speech, using a rather large vocabulary. He spoke with a generous usage of descriptive adjectives but seldom used verbs or pronouns. His comprehension of arithmetic, reading, and writing was impaired and his ability to answer direct questions dealing with abstract ideas was practically nil. The principle aim in the aphasic training program has been to improve his general understanding of written and spoken language and to effect improvement in communicating with other people. The treatment program included exercises in simple reading, writing, and arithmetic, together with training in recognizing the phonetic relationship between sounds and letters. Color identification and a group type therapy with other aphasic patients has reduced apprehension and anxiety, rendered the patient more at ease, and stimulated his desire and capability to improve his conversational ability. The patient's gait, general health, and appearance is markedly improved. Recognition of spoken and written language

usage has improved to such an extent that he may carry on his training program in speech and education, using various types of educational facilities which are available. The objective of his rehabilitation program consisted of getting sufficient return of his physical and mental faculties to enable him to resume at least a part of his former work as a rancher and farmer. This, in large measure, has been accomplished.

Conclusion

These case histories indicate that definite improvement of severely handicapped patients, having extensive impairment of speech, can be achieved by a well-planned and skillfully executed speech therapy program. Associated abnormalities, such as facial paralysis, inability to chew and to swallow satisfactorily also can be treated effectively. The use of neuromuscular re-education, breathing exercises, voice training, and articulation exercises combined with appropriate mobilization therapy and visual and auditory stimulation constitute an effective treatment program for various types of speech abnormalities, including different types of aphasia. One may arrive at still another conclusion, namely, that it is possible to obtain significant improvements in aphasia and motor speech impairment even in the presence of extensive brain loss and damage due to multiple abscess formation. It is demonstrated quite conclusively in the final analysis that physical medicine has a very real and worthwhile service to offer to patients having speech defects and improper function of the various mechanisms of speech as well as an inadequacy in the art of applying speech.

Summary

A brief description is made of human speech, together with that of the serious physical, vocational, emotional, mental, and sociological disabilities which result from a severe impairment.

An enumeration is made of some of the primary speech defects, together with some of the common clinical conditions involving defective speech, which may be treated by physical medicine.

A brief discussion is made of the importance of speech in the modern business world and how it relates directly to physical and vocational rehabilitation.

Some of the principles of speech production are briefly discussed and a classification and discussion of the main components of voice science are described, namely, respiration, phonation, resonance, articulation, and psychological, mental, and emotional training.

Neuromuscular re-education and speech training, together with mobilization therapy, as applied to speech, is briefly presented.

Two case histories presenting examples of different speech problems are described, which show various types of problems which may be treated satisfactorily by speech therapy.

It is concluded that speech therapy has a very definite role to play in physical medicine, and that departments of physical medicine and rehabilitation should include a well-equipped speech therapy department, staffed by one or more specially trained speech therapists who understand and employ the basic principles of neuromuscular re-education in combination with other exercises and treatment procedures employed in speech therapy. It is further concluded that physicians who practice physical medicine and other staff members of physical medicine and rehabilitation centers, as well as departments of vocational rehabilitation, and hospitals and clinics be informed of the services available for the treatment of speech abnormalities by physical medicine. It is urged that members of our specialty take a more active interest in speech therapy and establish a speech therapy service as a part of their practices, along with participating in a program of informing the public that physical medicine has a service to offer the disabled individual with either a minor or major speech abnormality.

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Psychiatric Aspects of Physical Medicine and Rehabilitation: Therapist-Patient Relationship

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Introduction

With the progress of the art and science of medicine, we are becoming more and more aware of the fact that even though man—the individual—is exposed to many apparently unrelated stimuli, all external and internal influences affect the organism as a whole. The development of this organism may be considered as being dependent largely upon three basic phenomena: Physical status, psychological reactions, and interpersonal relationships (actually the last two can be grouped together as socio-psychological).

It is the purpose of this paper to indicate the importance of the interrelationship of these phenomena to physical medicine, and particularly to show the significance of interpersonal relationship between the therapist and the patient not only in its effect upon the treatment of the individual "as a whole," but also in reference to psychiatric management of a local lesion.

Interrelationship Between Somatic and Psychological Reactions

Popularization of modern medical concepts in the last few years makes it hardly necessary to stress the unity of "physical" and "mental." Cobb¹ even

went as far as to say, "I solve the mind-body problem, therefore, by stating that, there is no such problem. The dichotomy is an artefact; there is no truth in it. . . ." Recent discoveries in the field of "psychosomatic medicine" and the frequent "somato-psychic" reactions (we are all familiar with depressions caused by serious physical illness) offer evidence of the inseparable interrelationship between the so-called "body" and "mind." Noyes defines mind as, ". . . a collective designation for all those manifestations of the organism that result when it functions as a whole, i.e., as an individual personality."²

Definition of "Emotion"

As this work is primarily based upon the influence of emotions, a definition of emotion is in order. It is not an easy task. A concept of this complexity cannot be defined even approximately by one statement. The definition, or rather description, of emotion as given by John Reid³ is a valuable contribution towards the understanding of this attribute. To him, "An emotion is rather an acute disturbance, involving marked somatic changes, which is experienced as a more or less agitated feeling. . . . Both the feeling and the behavior which expresses it as well as the internal physiological responses to the stimulus-situation, constitute a dynamically whole, which is the emotion. Thus an emotion is at once

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physiological, psychological, and social—since other persons are usually the most highly emotogenic stimuli in our civilized environment.”

Inadequacy of Sectoral Medicine

A concept which has perhaps been given more lip service than most other recent medical philosophies is the idea of treating “the whole man”—the “holistic” approach. However, one can point out the clinical importance of this concept and in contrast, the inadequacy of what we might call “sectoral medicine.” A case in point is that of a hypertensive patient who was treated by electrotherapy for ecchymosis of the orbital tissues. She showed signs of restlessness during the treatment which proved to be external evidence of extreme anxiety. We learned that the patient was nearly electrocuted during infancy. Continuation of the therapy even though effective locally might have caused irreversible harm to the patient because of her marked hypertension. An explanation of the innocuousness of the procedure with an invitation to examine closely the electrodes substantially decreased the fear element. We thus see that situations experienced in another field (psychological) at apparently an unrelated time (many years ago) have a direct bearing upon our immediate “physical” management of the patient. We cannot compartment our medical approach into sectors such as “physical” or “psychological”.

Role of Therapist-Patient Relationship in Physical Medicine

1. *In a Total Personality Approach:* The physiatrist or physical therapist may relate himself to the patient over a period of months or even years and through more senses than most other individuals. For instance, he is not only heard and seen by the patient but is also in frequent contact with him through the sense of touch and even that of smell. There is a special psychological effect due to “laying down of hands”;⁴ also our emotional reactions to smell have been grossly underestimated.^{1,5} Thus the

therapist becomes an active source of “emotogenic stimuli” as previously defined. Interpersonal relationship influencing the total individual and his general welfare is of great importance. Many of the patients we treat present traits which irritate us and bring about a critical (hostile) “counter-attitude” within ourselves. This attitude is usually sensed by the patient and as a result a psychological trauma is inflicted upon both the patient and therapist. Regardless of how effective our treatment of the local condition may be, we may nevertheless do harm to the total personality of our patient. This situation is analogous to that where a mother severely punishes a child because of a faulty habit. She may feel gratified at the successful result without being aware of the potential damage to his personality. No parent interested in the welfare of his child would want to pay this price. Similarly, no physician, whose primary responsibility is the general welfare of his patient, should seek local therapeutic success while ignoring his patient's total needs.

What are some of these needs? Basically, they are needs of “love” (attention, acceptance) and of protection against certain threats. One of the latter is *insecurity*. This is a general term, but for our purpose we will limit it to the fear of economic loss, which has as its basis fear of starvation, of cold, and so on. Another threat or fear is that of *loss of self-esteem*. Threat of *physical aggression* (including fear of pain) is constantly with all of us, but is more obvious in predisposed individuals.

How do we counteract these threats? By utilizing certain defenses which we call *mental mechanisms*. Some of us have a need to exaggerate these defenses so that they become expressed in behavior symptoms. At times these are not well tolerated in our culture and may constitute a “mental illness.”

When in his delirium a patient severely ill with pneumonia attacks us, verbally or even physically, we “understand and forgive” because we take into considera-

tion the fact that the man is sick. When we learn that the person who accidentally stepped on our favorite corn is blind, we even become apologetic. But how often do we realize that the cocky and demanding patient, the "little Napoleon," is merely utilizing the defense mechanism of "over-compensation" as a result of his own insecurity and fear? How frequently do we stop to think that the prudish lady, who is so vociferously critical because her big toe was left undraped, is employing the mechanism of "reaction formation"? (A classical example is that of a spinster who carefully locks the door and looks under her bed every night before retiring. The lady would be honestly overwhelmed with consternation were anyone even to suggest that this routine action actually stemmed from an unconscious wish to find a man under her bed). Once we understand that the behavior of the individuals we described is simply a way of defending themselves because of certain weaknesses or sickness, then we can treat them more objectively, more efficiently and with less wear and tear on our own coronary arteries.

2. *Attitude Toward Patients With Specific Disabling Conditions:* Much has been written concerning the psychology of the handicapped; however, only certain phases of it will be mentioned. In physical medicine one frequently deals with patients suffering from rheumatoid arthritis. The psychological aspects of this disease have been well described by Ludwig.⁸ He points out that dependency needs, common in individuals with rheumatoid arthritis, are expressed in such symptoms as failure to cooperate and proneness to remain in bed. On the other hand, other arthritics attempt to over-compensate by resisting any implication of such dependency and therefore resent help from others. These arthritics are very insecure and fear rejection and criticism. Unless the therapist is aware of such personality problems, he cannot treat the patient intelligently.

When we recognize that the cerebral palsy spastic child is particularly afraid

of loss of support and of sudden loud noises,⁹ we can be more careful in the manner of lifting him to the treatment table and in the location of our time clocks.

In general, however, the emotional problems of the handicapped are not specific to the individual disease entities, but depend primarily upon the basic personalities of the patients.

There is one symptom which deserves special attention in the practice of physical medicine and that is *pain*. Cooper and Braceland⁷ represent painful syndromes in the form of a "pain spectrum" subdividing it into a "neurologic"—perceiving and a "psychiatric" or reacting phase. Wolff and Goodell¹⁰ made a statement in relation to pain which strongly supports the thesis of this paper: "It is apparent, therefore, that the state of the patient-physician relationship will seriously modify the reported effect of any analgesic agent or procedure."

3. *The Aged:* The scope of Physical Medicine in geriatrics is increasing in proportion to the growth of this field. Many of the symptoms of the aged have strong psychogenic components. Here the physiatrist must be keenly on his guard not to intensify the emotional problems of his senescent patients. Diehl,¹¹ discussing the psychological aspects of these individuals,⁸ calls our attention to their need of self-protection which is expressed in such traits as caution and indecision. Irritability and resentment are a result of their growing insecurity. Once these reactions are understood, we can more effectively and humanely approach our elderly patients. As a counter-reaction against dependency needs, many older individuals deeply resent being assisted. We must be careful to allow these patients to help themselves as much as possible. This is a good general dictum for patients of any age group.

4. *Therapist-Patient Relationship with Psychiatric Patients:* With the establishment of physical medicine and rehabilitation services in psychiatric hospitals¹² there is a definite need for physiatrists,

physical therapists and other members of these services to become acquainted with the proper approach to patients suffering from mental illness. This approach to the psychiatric patient is a fundamental part of his treatment. The Menningers¹¹ have pointed out the importance of maintaining a uniform *attitude* toward each individual patient according to his specific emotional needs. They state that "... the attitude assumed toward a patient is probably more important than any particular activity. There is reason to believe that the manner in which we say things and the atmosphere created through our attitudes is actually more important than what we say and what we do. Many patients react to our feelings and manners much more than they do our words."

5. *Other Considerations:* Some patients are resistive to treatment, other patients, on the contrary, become a problem because of their unconscious unwillingness to terminate a course of therapy. These are difficult to cure. The underlying cause is "escape into illness." Some escape from an unpleasant environment, others, suffering from reactions of guilt, feel that they "do not deserve to get well"; however, the patients we are most likely to meet are those who because of secondary gains or because of dependency upon the therapist, "choose" to continue with their symptoms. This is particularly true in physical medicine where the relationship between the therapist and the patient can be very close and prolonged. On the other hand the therapist must guard himself or herself against utilizing the treatment situation merely as a means of satisfying his or her own emotional needs.

6. *Importance of Therapist-Patient Relationship in the Management of a Local Lesion:* The literature on the significance of therapist-patient relationship in physical medicine is rather scant; however, there is another important aspect of the socio-psychological effects of this relationship which, to the best of my knowledge, has not yet been ex-

plored. I am referring to its role in the treatment of a "local" condition. Pavlov, Cannon, and more recently H. G. Wolff, have made a formidable contribution to medicine by demonstrating an intimate connection between psychological phenomena and biological processes controlled by the autonomic system. As a result of these studies, certain experiments were reported in a recent publication: "Life Stress and Bodily Disease."¹² These experiments have a direct bearing upon our subject and will be briefly discussed.

In one experiment twenty-four patients and controls were tested for neuromuscular tension by means of electromyographic recordings. The subjects were exposed to such emotional stresses as a skit where a domineering nurse refuses to grant time off to a subordinate; or they were asked to imagine a man whipping a horse or a sudden ringing of a bell. The subjects were also asked to remind themselves about a defect they preferred to hide. Rheumatoid arthritics and hypertensives showed significant *muscle tension* in response to above stresses ("normal" controls and rheumatoid patients receiving psychoanalytic therapy responded to a lesser degree). In another experiment there was a change in *electrical resistance of the skin*.

Other experiments with a group of patients that were suffering from backaches led the investigators to postulate that "a relative *diminution in muscle blood flow* accompanies the state of conflict and anxiety and enhances the *accumulation of noxious metabolites* in the tissue spaces of the hyperactive muscles."

In measuring cardiac function and circulatory efficiency, it was found that "*Tolerance to exercise was impaired* during periods of anxiety and resentment related to stress . . ." Studies in blood pressure confirmed that "during certain types of emotional conflict, all of the subjects, hypertensives and normotensives alike, responded with *increases in blood pressure* . . ." and it is significant that there was no striking outward evidence that the subject was undergoing

a strenuous emotional experience. Another study revealed that when the reaction to emotional stress was accompanied by an elevation of blood pressure, the *viscosity of the blood* invariably *increased*. It has also been shown that at least in the hypertensives there is *increase in peripheral resistance* during such stress.

One cannot generalize in reference to the somatogenic effect of emotional stress. Our body reactions will vary depending upon the "type" of stress. Frightening overwhelming stress, such as can bring forth the alarm-reaction described by Selye,² produces physiological changes which differ from those effected by gradual anxiety producing stimuli. Diverse personalities, with dissimilar childhood and environmental backgrounds will react differently to the same stress. Also, the situation the patient happens to be in at the time plays an important role. Nevertheless stresses described in the experiments noted can, and usually do, exist in a psychiatric clinic.

To clarify the correlation between emotional stress and the effectiveness of technics utilized in physical medicine, an oversimplified hypothetical case is presented.

Our patient is a married, moderately hypertensive man of forty-eight, father of five children, who had been adequately providing for his family as a precision watchmaker. About a week ago he suffered an injury to his right (dominant) hand requiring mild surgical intervention after which he was referred to physical therapy.

Our therapist (for special emphasis we will cast her in a "heavy" role) is a young woman recently graduated from a physical therapy school. Though well acquainted with procedures she neglected that phase of training which dealt with psychological aspects of therapy.

She greets the patient with a dry "hello" while scrutinizing his attire and abruptly commands him to get on the treatment table in spite of the fact that the patient seemed anxious to talk to

her.

Let us analyze briefly the patient's emotional reactions to this approach. The patient thinks: "She does not like me, she seems to be angry at the world and will take it out on me" (connoting loss of "love" and threat of pain—physical aggression). "She is not interested in me; she does not know my problem. How can she help me?" (a threat of insecurity because of possible loss of earning capacity due to inadequate attention and medical care). "It is true that I don't look presentable—I tried to dress as best I could—but she does not have to be so obvious about it" (loss of self esteem). Furthermore, the patient begins to identify the therapist with a cruel aunt in whose home he was raised as a child after his mother's death. This brings certain repressed anxiety producing conflicts closer to the surface.

There are many other reactions the nature of which the patient is even unaware, except through a general feeling of anxiety. Suddenly a loud bell rings close to his ear—the time clock. A little later he observed his therapist gravely whispering something to her colleague while pointing to her own hand after a few glances in his direction and towards the doctor's office. The patient construed it to mean that the physician informed the therapist that there was little hope for him, the patient, to earn a living by the use of his injured hand. Actually the conversation revolved about the therapist's desire to leave early to buy a dress as soon as she finished with the patient, provided the doctor had no objections. One does not have to tax his imagination to realize the emotional turmoil in which our patient can find himself.

What influence does it have, however, on the benefit secured from the treatment? In view of the experiments described, as a result of this emotional stress we may expect the following: Diminution in the blood flow (due partly to the increased viscosity of the blood and to greater peripheral resistance); because of decreased tolerance to exercise optimum results cannot be expected

with this therapy; accumulation of noxious metabolites does not encourage proper healing of the tissues, and change in electrical resistance may affect the expected benefit from electro-therapy. Sustained muscle tension would retard the results of most therapeutic efforts. Even if only some of these phenomena are in operation, one can readily see that such treatment cannot attain optimal effectiveness. But the therapist is astonished at this lack of progress. She usually ascribes it to some mystic cause or blames the patient for it: "He just wouldn't relax!"

Discussion

In conclusion, I would like to reassure those who might interpret this presentation as a suggestion that to practice physical medicine one should become a psychiatrist first. No, but to practice *medicine* one must always take into consideration the emotional aspects of the patient as an individual as well as their relationship to the disease. This is not always done.⁴ The scope of this paper does not permit a more detailed description of the detailed positive approach and of situations to be avoided in a therapist-patient relationship in physical medicine. A few general attitudes were discussed some of which may seem to be merely a matter of "common sense." It is hoped that this paper offered some clarification as to *why* these attitudes are important and necessary in the treatment of the patient.

Summary

Emotional factors are important in general medicine and particularly in physical medicine.

The effect of therapist-patient relationship in the treatment of the individual as a whole has been discussed with special emphasis upon the import of such relationship in the field of physical medicine.

Experimental evidence has been cited to demonstrate the influence of emotional stress upon the physiologic functions of specific organs and tissues.

A specific illustration of the signifi-

cance of therapist-patient relationship in psychiatric management of a local lesion has been presented.

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Preschool Training for Cerebral Palsy

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Effective treatment in any pathological syndrome begins with an accurate diagnosis and complete evaluation. In the condition cerebral palsy, more than any other, are the diagnostic efforts more far reaching and the evaluation more comprehensive, for the treatment is directed not only at one individual but at the relationship of that individual to his environment. Whatever treatment program is adopted, its objective must necessarily be to enable the child to make the most of what he has; and while society as a whole cannot be expected to alter itself to conform to the needs of the adult cerebral palsied, nevertheless the immediate environment of the young child may be modified to provide for healthy growth of the entire family unit. In some instances this phase of treatment may assume greater importance than drugs, bracing or exercise, and it is the responsibility of the physician to see that it is not neglected.

The diagnosis of the child's condition begins with an appraisal of the parents' attitude. There may be resistance to acceptance of the handicap; there may be overt rejection or over-compensation for rejection. Marital difficulties or domination by grandparents may preclude success of any treatment until these problems are resolved. Normal siblings should be evaluated also to learn their effect upon the child, to enlist their aid in his treatment and to correct or prevent possible problems on their part.

The examination of the child himself should be undertaken with the foregoing information in mind. The determination of type of neuromuscular disability is usually not too difficult. Modalities pre-

scribed are dependent on far many more things than the result of response to a reflex hammer or the ability to walk a straight line. In the evaluation of the child it is important to establish which type or types of cerebral palsy exists, for while there are basic problems common to all types, each has certain problems which occur more commonly in it. In spasticity and rigidity contractures are more prone to occur, and there is more likelihood of cortical damage. The athetoid has a slow maturation rate, not all of which is explainable by his involuntary movements. A hearing deficit may account for his speech retardation, particularly if the pathology is due to Rh incompatibility. A child who is given an early diagnosis of ataxia may prove later to be one with endogenous mental deficiency.

It cannot be emphasized strongly enough that the neuromuscular evaluation is but one step in the total evaluation of the child. Psychological and social maturity testing should be done at frequent intervals to determine a rate of growth rather than a set I.Q. Testing of functional motor patterns should likewise be done at intervals and interpolation made between the child's chronological age, mental age and his handicap.

No matter how young the child when first seen, an objective for adult life should be set, taking all the above components into consideration; and at each subsequent visit the veracity of the objective should be questioned and changed if necessary. The type of training program prescribed will depend upon the set realistic goal.

There are three different types of life into which the adult cerebral palsied may enter. The first of these is that of academic education and employment. For the minority who fall into this classification, emphasis should be laid upon the skills of reading, communication and

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abstract thinking. Intensive training in coordination activities is warranted.

The second and larger group will profit most from an occupational education in which abstract thinking is not required. Here training in following directions, in social independence and in gross activities will insure greater success in adult life. For this group prolonged training in academic subjects is time wasted and leads only to frustration, for both the child and his teacher.

The third group is composed of those children who have sustained such severe mental and physical trauma that no contribution to society is possible; here the objective is to make good institutional citizens, or to lessen the burden of care in the home if they remain there. This group will profit from neither of the training programs mentioned but they and society may derive benefit from a program of self-care education with training in dressing, toilet, ambulation and behavior control.

There remain some children in whom brain damage has left intact only the vegetative centers. No form of treatment is indicated. Here nursing care only is indicated with prevention of contractures to maintain good hygiene. There can be no greater kindness to a parent, a child, a therapist, or a teacher, than to set an honest goal, though this may require a great deal of time and effort.

Several months may elapse before all concerned agree on any evaluation but the time is well spent.

The training of the child with cerebral palsy, as with his normal sibling, takes place throughout the waking hours, and all those who are in direct contact with the child should be aware of the objective set. The principles of treatment to be prescribed are carried out in the home, the classroom, the therapy room and in the community. There should not be a rigid division of the disciplines of training between various experts who work with the child, but rather a concerted effort of all concerned to reach a common goal with

each person contributing his specialized knowledge to the general process. Indeed, the great majority of children with cerebral palsy will not have the benefit of highly developed training centers with their well trained staffs and expensive equipment. These children can still be trained to perform to the full limit of their capacity just as has been done in previous generations. The decisive factor is wise, accepting and understanding parents and a home which meets the needs of the child.

Just as an evaluation of the child begins with an appraisal of parental attitude, so does the training program begin with the resolution of the parents' emotional problems. This may be accomplished by the physician who is willing to listen and counsel, by the trained social service worker, by the minister, teacher or therapist. In some instances, intensive psychiatric treatment may be needed. It is a physician's responsibility to explain the results of the evaluation, the objective set and the general principles of treatment in terms a parent can understand.

The most important phase of training of the child himself is the social phase, for success as an adult depends upon a pleasing personality. Training in emotional control and in group living should proceed concurrently with opportunities for personality development and the assumption of responsibility.

The faculty of speech is more to be desired than any other function, and all persons in contact with the child can encourage its development. Natural mother-and-child play forms the basis for a good functional program with imitations of lip and tongue movement, cooing, vocalization, story-telling and picture identification. A rigid program of definitive speech therapy can be detrimental when begun too early before language has a natural free flow. When this point has been reached, however, all efforts should be made toward making speech intelligible, using a combination of exercise to the muscles of speech and respiration, articulation training

and amplification if so indicated.

The normal child sits, crawls, stands, develops opposition, eye-hand coordination, and finger dexterity at certain ages which are predictable. A definite amount of time is required for maturation of cerebral tissue to make possible the performance of these and many other activities.

In the normal child this process is called "growing up." In the cerebral palsied child, the appearance of a new activity is all too frequently called "improvement" or "response to treatment," whereas actually it is simply another stage in the growth process, an indication that other brain areas have matured.

The principles of motor training are maintenance of a good mechanism which can be used as the directive force appears, and encouragement and strengthening of muscles and reflexes to gain the maximum amount of function.

Training in the motor phase should be accomplished in as natural a manner as possible and the child not be made to feel that his exercises are the main purpose of living. In setting up the prescription for exercises and activities several factors should be taken into account: The child's developmental age, chronological age, his predominating movement patterns, his weaknesses, contractures and deformities and his state of general health. It is fruitless to prescribe long hours of training in independent standing balance for a child whose developmental age has not reached that point at which the reflexes which initiate independent standing appear. The developmental activities by which normal children learn the art of standing, walking and climbing can be adapted to the child with cerebral palsy, taking into account the particular needs of his handicap and his abilities. Rolling, hand and knee standing, knee standing, crawling and — most important — free play on the floor will activate and strengthen muscle groups which lie dormant during passive exercise. Specific exercises and stretching should be applied where needed and

activities and equipment which stress these positions be incorporated into the functional program.

Training in self-care should be initiated as early as possible but again keeping in mind the fact that a particular procedure is possible only as the brain reaches a certain stage of development. Toilet training and independence in toileting are a primary objective when at all possible.

The prevention of deformity is one of the chief concerns of these early years, and instructions might well be given to all parents regarding good habits of sitting and standing posture. The reverse tailor position contributes to the development of knock-knee and should never be allowed. Chairs and work tables should be adjusted so that the child's feet are planted firmly on the floor, he has adequate support to back and head, and the working surface is at a functional level.

Gross hand activities are in order at this early age as finger dexterity has not yet appeared in the pre-school years. The standard educational toys are well adapted to the needs of the child with cerebral palsy, but the same training can be given with the ordinary articles found about the home, such as kitchen implements, spools, boxes and crayons. The integration of the child into the family life will provide many opportunities for hand training and accomplish personality development as well.

Training in the sensory phase may require special attention. The changes which can be produced in the total picture of a child when a visual defect is corrected or a hearing aid applied are too well known to need discussion. The provision of a wide variety of experiences with sights, sounds, textures, weights and temperatures are a part of the growing up process. Many children will derive benefit from training in rhythm which may be provided through records, metronome, marching, hand clapping, etc.

The last phase of training is that of abstract thinking, but in cortical damage this ability is often lost, in which

case concrete teaching methods must be applied. Many problems encountered in the primary grades would be averted if more attention had been paid to basic concepts earlier in life. These basic concepts include form matching, color matching, space and quantity concepts and the ability to copy. A short period of daily training in these activities can be given by the mother. Using a neutral paper various forms can be matched, and with objects or paper, colors can be taught and matched, then gradually the two concepts combined. The idea of space is encouraged by the use of building blocks or any of the put-together toys. The concept of quantity does not mean the simple repetition of numbers but rather the concrete expression of numbers such as bringing two apples or four oranges. Practice in the copying of simple forms may avert later difficulties in learning to write without inversion.

In these training periods it must always be kept in mind that in the child with brain damage, whether there is motor disability or not, attention span is short, there is hyperactivity and an exaggerated response to frustration.

The six phases of training — parental, social, speech, motor, sensory, and conceptual — are the basis around which the child's future education and occupation are to be built. In each child the emphasis upon a particular phase will differ, but no one phase is more important than the other. Habit patterns in each phase are set in the pre-school years, and it is only rarely that these can be altered in subsequent periods. With an accurate evaluation, a realistic setting or objectives, and a well-rounded living and treatment program, a child will perform to the fullest extent of his capacities if he is permitted to do so.

CORRESPONDENCE.....

Gentlemen:

We have read with great interest the article "Relaxation of Spasticity by Physiological Technics" by Milton G. Levine, et al in the April 1954 issue of your journal. May we be permitted to take up some of your valuable space to comment on a serious misunderstanding. In discussing various approaches to the problem of reducing spasticity, the authors mention one of our papers and comment on it as follows: "Bobath and Bobath employed tonic neck reflexes and other postural reflexes in the treatment of spasticity."

We do not recommend the use of tonic or other postural reflexes for the purpose of reducing spasticity. On the contrary, we hold that these static reactions have to be inhibited. We have argued that spasticity and the static-postural reflexes are co-existent, both caused by a release from higher inhibitory control. Spasticity can only be reduced and permanently controlled by the freeing of higher integrated movement reactions, the righting reflexes and equilibrium reactions, and by voluntary activity utilising these automatic patterns.

Yours sincerely,
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Evaluation of 300 Cases of Shoulder Pain

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Shoulder disabilities are common problems confronting the physiatrist. They are serious problems for individual workers because clinical symptoms directly threaten their earning capacity, and for industry because of delays in production which arise from the incapacity of skilled workers.

This study consists of an analysis of 300 consecutive cases of shoulder pain referred in a two-year period to the Physical Medicine Department of the Sidney Hillman Health Center in New York City, operated for its members by the Amalgamated Clothing Workers of America. All these patients were employed in the clothing industry. The occupations represented were: tailors, operators, cutters, finishers, bushelmen, trimmers, pressers, etc. Workers in all these categories perform rapid repetitive motions of the upper extremities throughout the day.

The age range of these patients was fifty to sixty-nine years, with an average age of fifty-nine for men and fifty-two for women (table 1). From the

Table 1: Sex and Age Distribution

	Age Group							Average Age
	20-29	30-39	40-49	50-59	60-69	70-79	Total	
Men		9	21	65	73	23	191	59
Women	2	6	20	57	22	2	109	52
Total	2	15	41	122	95	25	300	

standpoint of industry, it was obvious that pain in the shoulder was affecting the most experienced people. The sex

distribution in the study proved to be of no specific significance, since it corresponds proportionately to the total number of employees of each sex.

Table 2

	Male	Female	Total
Right Shoulder	97	51	148
Left Shoulder	79	33	112
Bilateral Involvement	9	21	40
Total			300

Table 2 indicates that both shoulders are involved. There appears to be no special predilection of right or left shoulder involvement to any great extent, although some predominance on the right side was noted. This may be attributed to the fact that the majority of the workers in the industry use both upper extremities at work; for example, one arm for working, the other arm for throwing bundles of clothing aside.

An understanding of the intricate mechanism responsible for the extensive range of motion and skillful control of the arm as a lever is necessary before insight into the causes and treatment of shoulder girdle pain can be developed.

The deltoid is primarily responsible for placing the arm at various levels of elevation. The rotator cuff controls the arc through which the arm is capable of function. The relationship between the function of the deltoid and rotator muscles is so close that it is difficult to visualize pure motions at the shoulder joint.

Moreover, a number of involuntary motions are present as a result of the changing relationship of the head of the humerus and the glenoid when the arm is elevated. Rotary movements of the shoulder involve not only the dynamic function of the muscles controlling the position of the head and shaft of the humerus, but also the coordinated ac-

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tivity of the muscles which stabilize the scapula.

In reviewing our cases we were impressed by the fact that the strain of repetitive movements produces wear and tear on the shoulder rotary mechanism. This is contributed to in large part by postural factors. The majority of the workers in the clothing industry work in a bent-forward position in a chair or standing, without back support. This postural strain accounts for the frequent finding of the scapulo-costal syndrome in this group.

The scapulo-costal syndrome is postural, mechanical and reflex in nature. It is manifested by pain which may radiate from the shoulder up into the neck and to the occiput, or pain in the shoulder alone. It may radiate from the scapula around the ribs to the front of the chest, or it may radiate from the root of the neck across the shoulder down the arm into the medial two fingers, simulating involvement of the ulnar nerve.

When examining patients with a scapulo-costal syndrome, it was found that glenohumeral motion, or motion between the head of the humerus and the glenoid, was not impaired; but elevation of the arm above the right angle, revealed tightness of the muscles stabilizing the scapula. This impairment of scapulo-humeral rhythm is due to alterations in the coordinated relationship among the muscles controlling the scapula and arm.

In patients with painful shoulders the etiology of which is related to intra- or peri-articular pathology, glenohumeral motion is markedly restricted, and scapulo-humeral rhythm cannot be determined because the range of movement of the arm at the shoulder is so markedly impaired.

The X-ray examination in the scapulo-costal syndrome is negative. In peri-articular or intra-articular pathology, calcifications about the shoulder joint and thickening of the peri-articular structures can be observed. A common finding, however, in practically all cases

of painful shoulder is that the head of the humerus rides high and appears to be jammed against the coraco-acromial arch. This is present in X-rays taken in a sitting or supine position.

Muscle spasm in the vicinity of the shoulder girdle is a common finding in practically all cases of pain in the shoulder, but it is not necessarily present in every case. A considerable degree of incoordination is observed, particularly where there is peri-articular pathology. This is due to the inability of the rotator cuff muscles, the external rotators and especially the supraspinatus, to depress the head of the humerus in the glenoid so that the deltoid may elevate the arm.

These patients on examination show typical "hiking" of the shoulder on abduction even in the absence of gross trapezius spasm. This is caused by alteration in the normal mechanics of the supraspinatus in the presence of an attenuated cuff mechanism and occurs with or without calcific deposits in the supraspinatus tendon. It is the change in this mechanism which accounts for the pain in the majority of these patients rather than the presence or absence of calcium. The presence of calcific deposits in the tender portion of the supraspinatus, in the cuff, or even in the bursa, is symptomatic only in those cases in which it can be demonstrated, that on abduction these tissues are jammed between the greater tuberosity of the humerus and the acromion.

Table 3: Soft Tissue Calcifications

	Male	Female	Total
Present	69	41	110
Absent	56	30	86
No X-rays	66	38	104
TOTAL	191	109	300

Table 3 indicates that in 196 patients, X-ray findings revealed that 110 had soft tissue calcifications. None were subjected to X-ray therapy, and in most instances, the presence of the calcium was ignored. Treatment was prescribed in accordance with the specific indications found on physical examination

rather than on the X-ray finding of the presence of calcium.

Modern mechanization of industry has eliminated the need for heavy physical labor. Fast repetitive motions however, have caused the same kind of impairment over a longer period of time as heavy physical labor produced in a short period of time.

The rotator cuff mechanism has a tendency to become worn, frayed and attenuated. This condition is hastened by postural impairment while on the job. The determination as to the degree of attenuation of the shoulder cuff mechanism was made on the observation of the presence of the "wince and jog" of Codman. These patients were able to elevate the arm to the ninety degree angle, but not above. When the arm was passively raised, they were capable of maintaining the position of full elevation. Upon lowering the arm, however, as they approached the ninety degree angle or, in many cases, a little less, the "wince and jog" was present.

All our patients did not have X-rays of the cervical spine. Table 4 indicates

Table 4

OSTEOARTHRITIS CERVICAL SPINE

	Male	Female	Total
Present	24	21	45
Absent	121	50	171
No X-rays	66	38	104
TOTAL	191	109	300

OSTEOARTHRITIS OF THE SHOULDER

	Male	Female	Total
Present	21	13	34
Absent	104	58	162
No X-rays	66	38	104
TOTAL	191	109	300

in 45 patients of 196 who did have X-rays of the cervical spine, evidence of osteoarthritis was present. The osteoarthritis was considered to be symptomatic only when persistent limitation of movement in the neck associated with specific radiation attributable to nerve root irritation was demonstrated. Table 4 also shows that osteoarthritis of the shoulders rolled forward and an in-

In the scapulo-costal syndrome neck movements are usually not limited. Although the radiation pattern stimulates irritation of the ulnar nerve, the most prominent manifestations are spasms of the muscles stabilizing the scapula in the presence of poor posture with the shoulders rolled forward and an increased dorsal curve of the spine.

The principles of treatment involved in the alleviation of pain in these patients followed specific lines. Those patients in which symptoms were postural, mechanical and reflex required relief of pain and re-establishment of proper working, walking and sleeping habits. Where osteoarthritis was considered to be symptomatic, relief of pain by physical means followed by Sayre's traction. Traction routine at home with a makeshift halter, produced satisfactory results. In those cases in which peri-articular pathology and severe restriction of the shoulder were the predominating symptoms, relief of pain was the first requirement followed by a program of restoration of movement and increasing degrees of passive stress in the rotary and elevation planes of the shoulder.

The treatment prescription depended primarily upon the physical examination and the establishment of a diagnosis in one of the categories of the three groups described.

In the first group the scapulo-costal syndrome was found. Peri-articular structures were responsible for restriction of movement and pain in the second group. Previous attacks of bursitis were noted in some patients. In a number of instances, individuals showed evidence of osteoarthritis of the glenohumeral joint itself. The third group were those in which it was felt that the bony changes in the cervical spine were responsible, at least in part, for the symptoms.

In all groups, it was possible to demonstrate hardening of the muscles, tender points, trigger areas, what we considered to be in the category of myositis or painful muscular movement and so-called fibrositis. These were all considered to be secondary changes due to

the primary condition and not diagnostic by way of being directly responsible for the pain.

For purposes of relieving the pain, Novocaine infiltration into trigger areas, the shoulder cuff and shoulder joint itself, was often quite satisfactory for the performance of the necessary exercises for correction of the altered dynamics.

In conjunction with Novocaine infiltrations, physical modalities such as low-intensity diathermy, radiant heat, hot packs, Histamine iontophoresis and massage appeared to provide efficient relief in the majority of cases. Novocaine, and spraying with ethyl chloride, in many instances were found to be more efficient in relief of pain than the physical modalities.

Where pain was widespread, it was obvious that the infiltration of Novocaine could not possibly influence the entire area and the modalities were essential.

The use of Sayre's traction was helpful even in cases in which it was not considered that the changes in the cervical spine were directly related to the symptoms. The minimal spasms of the neck muscles and shoulder girdle muscles is often relieved by intermittent traction of between thirty and sixty pounds for fifteen or twenty seconds repeated ten or fifteen times, following relaxation with heat and stroking massage.

We felt it was quite important to make frequent observations on the patients with severe pain. They were seen daily. The chronic cases capable of working without considerable disturbance were seen once weekly. The passive movements used to restore motion in the peri-articular restriction were of the "Mennell type." This was done by the physician rather than the physical therapist. Traction before manipulation of the shoulder and gradual restoration of rotary movement before attempts to abduct the shoulder, are considerably more effective than pump-handle movements or pulleys. Pulleys are useful for home exercise providing the patient is instructed in six or seven of the various

positions necessary to restore internal and external rotation, forward and lateral elevation and finally elevation above the ninety degree angle. Simply sitting under the pulley and passively pulling up the affected arm is quite unsatisfactory unless tension in the rotary plane is applied to the shoulder before elevation is attempted.

It was our belief that the most important contribution made to these individuals with repeated attacks of pain in the shoulder and chronic pain in the shoulder was in relationship to their activities while at work and at home. They were advised to take short rest periods during the working day, to get out of the faulty postural working position and to perform active range of motion and postural exercises for a few moments at intervals throughout the day. It was our opinion that such short frequent rest and relaxation periods should be introduced throughout the clothing industry and other industries where bench work is performed. A rest period promotes relaxation of the tension of the holding groups of muscles in the working position. The time taken for the short relaxation and postural exercise periods throughout the working day is well repaid by increased work efficiency and production, as well as in the prevention of chronic fatigue syndromes to which most bench workers are subjected.

Summary

Three hundred cases of shoulder pain among employees of the garment industry were presented. The age and sex distribution were studied, and the diagnosis and treatment approach discussed. The findings at examination were described and the methods of differentiating between the postural, peri-articular and arthritic causes outlined. The treatment principles and suggestion of methods as they were used were mentioned. It was emphasized that the success of treatment depends upon adequate understanding of the needs of the individual based upon intelligent physical examination.

Spa Therapy on the American Continent

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Spa therapy is a branch of physical medicine which has been mainly developed in Europe. Looked upon with skepticism by most of the world, European spa therapy nevertheless has a highly rational biophysical and biochemical background. Vichy, Bad Gastein, St. Moritz, and Bad Nauheim, are not only playgrounds for the wealthy but places where treatments, prescribed for and supervised by physicians, may be had.

It is not generally known that in the United States there are many spas and resorts where balneotherapy is practiced under the same principles as in Europe. However, the majority of these spas are poorly supervised medically and only eight spas have so far looked for recognition and have been listed by the Council on Physical Medicine and Rehabilitation of the American Medical Association, which has set up specific standards. Among these are: Hot Springs, Ark.; Homestead, Va.; Buie Clinic, Texas; Saratoga Springs and Sharon Springs, N.Y. (Listing of health resorts in the United States has recently been discontinued by the AMA Council on Physical Medicine and Rehabilitation).

In Canada the resorts are few and are mostly situated in the western part of the country. Miette Hot Springs in Jasper National Park reach temperatures up to 120 F. at the source. The water is alkaline and contains mostly calcium and magnesium sulfate. The water of Banff Hot Springs has a temperature of 112 F. and contains many minerals, as well as carbon dioxide and hydrogen sulfide. The Radium Hot Springs in Kootenay National Park are supposed to be radioactive. No medical supervision is required at these spas. Persons using the facilities of the baths

must do so under orders from their physician or subject to their discretion. Attendants, however, usually warn bathers that immersion should not be continued for long periods.

Mexico is one of the richest countries in mineral waters. Its great number of volcanoes accounts for the abundance and great variety of mineral springs. Beautiful surroundings and excellent climate make Mexico the ideal place for a health vacation. Examples of good spas are: Ixtapan with its hot springs; San Jose de Purua with its carbonated, radioactive water containing sulfur and mud, and Penefiel in Tehuacan where the slightly alkaline water is bottled and distributed. However, medical guidance and supervision are woefully inadequate. There is no research whatsoever. Medical examination or a prescription is not required, and the attendants are not trained technically. The treatment regimen is entirely up to the individual, who usually overdoes it. It is hoped, nevertheless, that in this rapidly developing country balneotherapy will reach its goal in the near future.

In South America, Argentina has many thermal springs and saline lakes. Carhue, in the beautiful Sierras of the Province of Buenos Aires, is a strongly mineralized sheet of water covering an area of 60,000 acres. Mar Chiquita, in the province of Cordoba is another salt water lake, famous for its therapeutic properties. In the province of Cordoba and Mendoza there are a great number of spas at different altitudes, ranging from 1,900 to 9,000 feet.

In Bolivia the most famous thermal springs are those of Urmiri at an altitude of 10,600 feet. Their mineral waters contain sulfur, iron and magnesium. The most attractive resort in Brazil is Pocos de Caldas, 4,000 feet above sea level. It has a completely equipped hydrotherapy institute. All the resorts are at a comfortable altitude of between 3,000 and 4,000 feet, like Caxambu,

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Araxa, Rio Grande de Sul, Santa Catharina and others.

Probably the highest standards of management and medical supervision on the American continent are attained in Chile. The springs are numerous, and the range of their specific qualities is said to be most unusual. Resorts like Panimavid and Apoquina are easily reached from the capital. Columbia, Ecuador, Uruguay and Venezuela, all have spas, mostly frequented by the native population.

Principles of Spa Therapy

Spa therapy, to put it simply, is a forced vacation with a complete change of environment. It is a phase of modern approach to total rehabilitation. It involves physical and psychological adaptation to different customs, food, climate, and people. Together with hydrotherapy and the guidance of a qualified resort physician, the achievement of the spas in producing a desired non-specific reaction becomes understandable.¹

Balneotherapy has not as yet reached the stage where the agents involved or the active principles leading to rehabilitation of the patient can be precisely measured or identified. The multitude of factors involved makes this a difficult task. The composition of the mineral water alone cannot give any specific indication. The picture becomes more complex if we try to include the physiological and biological factors, which incorporate the reflex effects produced by skin irritation.

External application of mineral waters produces hydrostatic and dynamic, pharmacological effects through ionization, colloids and gas content. The role of temperature is well known. Internal application in the form of drinking the water or inhaling its vapors intensifies the chemical action.¹

In spite of this general knowledge some spas have an outstanding reputation which cannot be explained by their physical and chemical properties alone. Indeed, each spa has its own character, or "Brunnengeist." Conscious of the

deficit in the knowledge of balneotherapeutic problems, it is therefore recommended not to pay too much attention to special indications resulting from variable and problematic water analysis, but to apply the general facts of modern pharmacology and physiology. The indiscriminate variety of indications, often given for commercial reasons, have at times discredited spa therapy in the eyes of the more scientifically minded physician.

The interest in physical medicine is not so much due to new physical inventions but to the fact that modern clinical therapy of chronic disease aims to correct and rehabilitate the whole organism. Balneotherapy is probably an excellent adjunct to, and has its definite place in, modern clinical treatment.

Selection of the Proper Spa

In selecting a spa for a patient the following points should be considered: 1) Physical properties of the mineral water are helpful but not decisive. Natural mineral waters contain trace elements, mostly metal ions, which act as bio-catalysts. Artificial mineral waters have none of these, and 2) the patient's condition has to be evaluated. For instance, sulfur baths are often recommended for arthritides.² A patient, whose circulatory system is weakened, will often derive more benefit from a warm, carbonated water. Most patients suffering from rheumatic disorders show an increased sympathetic tonus. Mineral waters have both cholinergic and adrenergic effects.³ The mineral waters may produce such different results as rise in blood pressure in hypotension, reduction in hypertension, or regulation of hyper- or hypo-acidity of the gastric juice.¹

Classification of Mineral Waters

Mineral waters are classified according to their mineral components—temperature, gaseous contents, and radioactivity. Three qualities determine the therapeutic properties.⁴

Thermal waters — the temperature is above the mean temperature of the locality in which they originate. They are

classified as subthermal with temperatures up to 20 C., thermal up to 37 C., and above that hyperthermal.

Carbonated waters — contain at least sixty mg. free carbonic acid per liter, and are used as refreshing drinking waters. When applied as a bath, carbon dioxide is absorbed through the skin, and eliminated through the lungs. It is impossible to reproduce artificially the same quality, probably because of the great pressure in the deep layers of the earth.

Radioactivity — only waters containing at least eighty Mache units per liter should be considered as radioactive.

Climate

Climate is a very important agent in spa therapy. It is a complex of different factors such as composition of the air, atmospheric pressure, humidity, sunshine hours, radiation, precipitation, wind, altitude, temperature, and season. They influence the organism by acting on the skin, respiratory tract, and sensory organs. In atmospheric changes there is also an adaptation of pressure within the body.

The main concern of the average vacationer is the climate measured in degrees of heat. But avoiding heat will not solve our problems. All the other previously mentioned factors, especially humidity and wind, determine the character of a resort.

Man and animals respond strikingly to changes in physical environment, especially with changes that alter the ease of body heat loss. Clarence A. Mills⁸ goes so far as to question whether the racial differences may not be basically those of diet or climate acting through the centuries. He concludes that climate has an influence on body growth, onset of puberty, and resistance to infections. Invigorating climate, as we find it for instance in Iowa, may lead to excessive stimulation or exhaustion of different organs.

Seasonal changes have a special significance in cardiacs. As the cold weather sets in, the combustion rate increases, and the body efficiency declines.⁸

We are, then, justified in discussing "winter stress" not only on the cardiac load, but also in chronic respiratory diseases and arthritis.

Generally speaking, Central North America, particularly over the upper half of the Mississippi River basin and the prairie provinces of Canada have the most stimulating climate with frequent storm fluctuations to be found anywhere. The South has less stormy winters, and the long summers are moist and warm. The best climate is to be found in the Southwest where a mild degree of stimulation is obtained by wider diurnal temperature changes. It resembles the ideal climate of the Mexican and South American highlands.⁹

A modern approach to the understanding of climatic factors was made by Manfred Curry of Germany and the United States, who died about three years ago. His most interesting book⁷ was published by the Office of Military Government for Bavaria in 1946. According to Curry, the reason for weather sensitivity is the presence of *Aran*, a gas similar to ozone. It originates in the ozone layers at an altitude of ten to fifteen miles, and is brought down by vertically descending air masses. While the ozone content is fairly constant, aran amounts are small and variable. Over 150,000 measurements with a Siemens-Reiniger instrument disclosed that each locality has a specific pattern of day and night aran concentration, which determines its climate. High values with little fluctuations are, for instance, characteristic of the climate of Palm Springs in the California desert. In contrast, the climate of the California coastal area shows great fluctuations. Barometric pressure, humidity, temperatures, etc., are not the only climatic factors to be considered. Curry distinguishes between three types of weather-sensitive persons: Warm-front sensitive, cold front-sensitive, and warm and cold-front sensitive types. Warm-front sensitive people are vagotonic, cold-front sensitive ones sympathicotonic. Exposure to sunshine and warm baths is well tolerated by cold-front

sensitive types, and the reflexes are increased. The warm-front sensitive type tolerates wind, high altitude and cold baths well, cannot sleep with windows closed, and the reflexes are diminished. Examples of high aran values are Miami Beach and Palm Beach, low value areas are Chicago and New York. North wind brings high and South wind low values. The most stable values are in the desert, regardless of the altitude. During summer and fall, fluctuations are smaller than during winter and spring. Whether aran is really such an important factor as Curry's reports indicate remains to be corroborated. It certainly would simplify our evaluation of spas and resorts.

Every year more than one million Americans go to Europe, and their number is steadily increasing. This is due partly to the efforts of Travel Bureaus, the spirit of adventure and the nostalgic desire of many foreign-born citizens to see again the old country. But a great many of the travelers go to famous spas for health reasons.

The Committee on Balneology and Health Resorts of this Congress has for the past six years made serious effort to promote the cause of spas in this country. It is suggested that this subject should receive the earnest support of all who are interested in building up our resorts. This requires teamwork under the leadership of physicians, and with extensive Government support. Grants and scholarships in resorts should

be supported by the government at the state level to foster and develop research in the spas located within their territory. Funds should be made available for the development of modern balneologic plants and recreational areas. The functioning of the Saratoga Springs Commission and the state supervised agencies in Hot Springs, Ark., are splendid examples of what government support can establish.

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CHICAGO SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

will meet jointly with the Chicago Rheumatism Society on Wednesday, February 23, 1955 at 8:00 P.M., University of Illinois, Illini Union Bldg., 1853 W. Polk St., Chicago.

SUBJECT: Rheumatoid Arthritis—Physical Treatment and Medical Management

SPEAKER: Howard F. Polley, M.D., Rochester, Minn. You are urged to attend this important meeting. Physicians, therapists, other professional personnel and their guests are welcome. For complete details write Gusta Davidsohn, M.D., Secretary-Treasurer, Mt. Sinai Hospital, 15th and California, Chicago.

EDITORIAL

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION
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American Congress of Physical Medicine and Rehabilitation
American Society of Physical Medicine and Rehabilitation



Teamwork in Medicine

Recent articles on "teamwork" in the field of rehabilitation have created conflicting concepts as to the role of the physician. Since physicians, today, are using the varied allied professions more extensively in the treatment of their patients, this issue seems to be becoming an increasingly complex problem. It has been observed that not only are members of the allied professions, such as vocational counselors and psychologists, questioning the position of the physician as the inherent leader of the rehabilitation team, but patients, too, are becoming confused about their relationship with their physicians. It is necessary, therefore, to clarify this problem and present a point of view which is fundamental in the philosophy and practice of medicine — that physicians, not members of allied professions, are charged with primary responsibility for patient care.

Teamwork is an everyday process. It is evident in almost every phase of business and in interpersonal relationships of those who are mutually interested in achieving a common goal. One of the primary requisites for successful teamwork is that all persons involved be able to subordinate their personal prominence to the efficiency of the team in order to attain the established objectives. To prevent divergence of such coordinated effort, it is essential that the team be led competently. The leader, in every case, should be best qualified and most appropriately charged with the responsibility for evaluating and managing the

total problem. In medicine, the doctor would be the logical leader of the team which has been formed principally to meet the disabled patient's need for restoration to the fullest possible physical, mental, social, vocational and economic usefulness.

It is the patient's personal physician who summons specialists to assist him in reaching this goal. For example, the general practitioner may call in the cardiologist to confirm or treat a heart condition, the physical therapist, or occupational therapist to render specific treatment, or the vocational counselor to provide vocational evaluation. Hence, the size of the team would vary with the types of problems manifested by the patient's condition as diagnosed by the physician. The nucleus of any medical team is the patient and his doctor. This team need not be increased if the objective can be attained without the assistance of other specialists or it may be increased to include representatives of many fields, such as the nurse, the social service worker, psychologist, vocational counselor, physical therapist, corrective therapist, occupational therapist, manual arts therapist, educational therapist, speech therapist, blind therapist, music therapist, etc., and, at times, even the patient's employer.

This concept of medical teamwork between the doctor and his patient has existed since time immemorial. Up until recently, teamwork has been practiced among the medical specialties in the

sense that a practitioner might call in specialists to aid and guide him in the management of the patient. The inclusion of allied professions and community resources in the medical team is a relatively new extension of this older concept. The approval and acceptance of the allied professions by physicians have contributed immeasurably to the advancement of certain phases of medicine, particularly in psychiatry and in physical medicine and rehabilitation.

Many private hospitals are not able or are not called upon to provide many of the services of the allied professions for their patients. Factually, patients who are admitted to these hospitals are referred by private physicians having medical privileges at these hospitals. Therefore, it is the private physician who, alone, would be responsible for assisting his patients in obtaining rehabilitation aid. In private practice, however, the tendency is for the physician to complete the necessary definitive care, and then to permit his patient to solve his own physical, psychological, social, or vocational problems which may have resulted from the illness. This is one of the contributing reasons for the large number of invalids in our population.

It is unfortunate that busy medical practitioners are inclined to ignore responsibilities other than those directly involved in the type of medical care for which they are best trained, and in which they are most interested. As a result, their patients are often compelled to seek additional help for themselves. Such independent action by patients has created a situation where the contacted agency, or member of an allied profession, has assumed leadership of the rehabilitation team. Although this procedure is not recommended, it is fortunate for the disabled patient that well-informed agencies, and well-trained paramedical specialists obtain medical reports from the patient's physician. These are used as a basis for all future considerations. Nevertheless, the patient's physician who is best qualified to determine the effect of a specific job on a specific medical condition is too seldom

asked for confirmation of the patient's vocational objective reached by the vocational counselor. In any event, by this twist of circumstances the physician has been erroneously placed in the position of consultant to the allied profession, instead of assuming direct responsibility over his patient's future welfare. In order to avoid this situation, we believe that the practitioner should transfer the responsibility of the patient's rehabilitation to a physician who possesses the special skill and training in rehabilitation just as he would refer a patient to a surgeon for surgery, or to a radiologist for x-ray therapy. Such a physician, most often a physiatrist, would summon those members of allied professions who could, in conjunction with him, contribute in meeting the specific physical, psychological, social, and vocational needs of each patient. He would assume the proper leadership for obtaining the most effective results commensurate with the patient's medical capacities or limitations. This team would include members of these allied professions who would perform as consultants and on the same level as medical specialists.

Specialists in the allied professions, such as psychologists, social workers, and vocational counselors have made noteworthy contributions in fields other than medicine; namely, the social worker in education and casework; the psychologist in education and vocational guidance; and the vocational counselor in education and vocational guidance. In these situations the physician, if required, becomes a medical consultant and a member of the team, with the psychologist, or social service worker, or vocational counselor, as the leader. It is believed that the tendency of the allied professions to project this arrangement into the medical field, has added to the present misunderstanding and confusion about the leadership of the physician in medical teamwork. In medicine there is a practical lesson to be learned from the medical specialist whose very practice depends on referrals of patients by other physicians for consultation. Should a specialist step out of his role as a

consultant and attempt to compete with the referring physician, his consultation practice would soon dwindle. This realistic setting dictates the proper position of the medical specialist as well as of the specialist in the allied professions.

A controversial point has been the question of authority in the management of the patient. Only training, knowledge, and experience in his special field can qualify a team member as an authority on the team, and full recognition and weight are given to the opinions and expressions of each team member. However, the authority for ultimate decisions rests with the physician, for his alone is the ultimate responsibility of the patient's welfare. Perhaps another reason for the confusion in understanding the team concept stems from the inability, or the refusal of members of the allied professions to subordinate their personal prominence and personal bias. In their anxiety to establish personal stature, or to obtain professional recognition for reasons of sustaining independent, private practices, they have lost sight of their proper roles as members of a coordinated team functioning in the best interest of a disabled patient.

We have attempted to clarify the position of the physician in the rehabilitation team. In order to achieve the goals of rehabilitation, the physician, as the logical leader, must be thoroughly acquainted with the scope and potentialities

ties of the allied professions, so that an efficient and well integrated team can be formed; he must consider the members of the allied professions on his team on an equal footing with medical consultants, called in to study and to help solve the specific problems of a patient. We believe that most of the misunderstanding and lack of harmony is due to the existing defects in the education and training of physicians as well as members of the allied professions. Some progress in this direction is being made through experience gained in the practical application of the team concept in the present existing rehabilitation centers. Further strides are evidenced by the fact that more and more medical schools are introducing courses in the philosophy and application of Rehabilitation. In addition, it has been observed that colleges and universities are similarly amending their curricula for the allied fields to bring the training in these professions in line with present-day concepts of the Rehabilitation team. With the gradual expansion of these developments, confusion and conflict will be resolved, and the proper physician-patient relationship will again become clear.

Arthur S. Abramson, M.D., F.A.C.P.

*From the Physical Medicine
Rehabilitation Service
VA Hospital
Bronx 68, New York*

IMPORTANT ANNOUNCEMENT

AMERICAN BOARD OF PHYSICAL MEDICINE AND REHABILITATION

The next examinations for the American Board of Physical Medicine and Rehabilitation will be held in Philadelphia, June 5 and 6, 1955. The final date for filing applications is March 1, 1955. Applications for eligibility to the examinations should be mailed to the Secretary, Dr. Earl C. Elkins, 30 N. Michigan Ave., Chicago 2.

PHYSICAL MEDICINE ABSTRACTS

Restless Legs. N. B. Nordlander. *Brit. J. Phys. Med.* 17(7):160 (July) 1954.

In 1945 Ekblom described a syndrome to which he gave the name restless legs. It exists in about five per cent of a normal population. The syndrome is a paresthesia described by the patient as a crawling sensation felt deeply in the legs, "in the very bone marrow," and sometimes amounting to real pain. It is usually bilateral and occurs when the patient attempts to sleep. The paresthesia then begins to torment the patient and forces him to move his legs about in the bed or to get up and walk for hours. Some patients try to diminish the crawling by washing their legs in cold water, and others try hot baths or massage. The paresthesia is often accompanied by cold feet and a feeling of weakness in the legs. However, when sympathectomies are performed and the legs become warm, the paresthesia is not relieved.

As long as the pathogenesis is unknown and there is no sure way to provoke the paresthesia, it cannot be labeled as a nosological entity, but rather as a syndrome, the etiology of which may be manifold. In most cases two intravenous injections of saccharated oxide of iron or of high-molecular polysaccharides (Dextran) gave rapid relief lasting for months. The therapeutic effect of such colloids in this condition may depend on a blocking of the reticulo-endothelial system, in which colloids are known to be stored for several weeks; but the role of this system in the etiology of paresthesias so far is unknown.

Quinacrine (Atabrine) in Treatment of Solar Dermatoses. A. R. Woodburne, et al. *A.M.A. Arch. Dermat. & Syph.* 70 (1):116 (July) 1954.

During the past year the authors obtained excellent results in treating chronic discoid lupus erythematosus by use of quinacrine hydrochloride. It has been shown that the time necessary to produce a minimum erythematous reaction of the skin by use of ultraviolet may be increased for a given patient by administering quinacrine for ten days. This information led to the determination of

what effect the drug had in the treatment of solar dermatoses.

Quinacrine hydrochloride administered orally proved far more effective than any other therapeutic agent employed by the authors in the treatment of solar dermatitis of all types. Four illustrative cases are given in detail. Page suggests that the pigmentation of the skin with a decreased photosensitive reaction explains the beneficial effect of quinacrine, while Sulzberger and Bear suggest that quinacrine acts as an anti-infectious agent. The authors favor the latter opinion because many of their patients reported complete relief from itching and burning within twelve hours after use of the drug and long before any pigmentation of the skin developed.

Shoulder Affections in Rheumatoid Arthritis. V. A. I. Laine, et al. *Ann. Rheumat. Dis.* 13(2):157 (June) 1954.

Rheumatoid involvement of the shoulder seems to be relatively rare compared with the involvement of peripheral joints. Since painful shoulders are common, the authors studied 277 cases of rheumatoid arthritis to determine the incidence of shoulder affections in rheumatoid arthritis and the varieties of painful disorders and their etiology. Accurate analysis of the cause of shoulder pain in rheumatoid arthritis is a necessary condition for adequate treatment.

Shoulder pain in connection with rheumatoid arthritis was found in 57.4 per cent of these patients. Arthritis, tendinitis, and bursitis, due to rheumatoid affections, comprise the dominating syndrome or 50.9 per cent of the different shoulder disorders discovered. Other disorders comprising 49.1 per cent included calcareous tendinitis, osteoarthritis, radicular symptoms, and the scapulo-costal syndrome, the latter being the most common (in 54.4 per cent).

The elimination of the accessory scapulo-costal syndrome by anesthesia of the trigger point offers welcome relief to the arthritis patient and facilitates his rehabilitation.

Review of the Pathogenesis and Allergic Aspects of Collagen Diseases. L. L. Pality. A.M.A. Arch. Dermat. & Syph. 70(1):67 (July) 1954.

The concept of the "collagen diseases" has been of inestimable value in furthering our knowledge of these obscure diseases. The list has grown from the original disseminated lupus erythematosus and generalized scleroderma to include rheumatic fever, rheumatoid arthritis, dermatomyositis, periarteritis nodosa, and serum sickness.

The basic pathology was first described as a systemic alteration of the extracellular elements of the connective tissue, consisting mainly in a mucoid and fibrinoid degeneration of the ground substance and the collagen fibers. However, recent work seems to indicate that the ground substance, rather than the collagen fibers, is the seat of the pathologic change. The ground substance is mucinous in nature and contains acid mucopolysaccharides. It is known to be subject to the control of many factors, including hormones, enzymes, and vitamins.

There still is a real danger of the term "collagen disease" being used as a catch-all to include diseases of obscure etiology, thereby stifling new avenues of approach to the study of the processes involved. The fibrinoid degeneration seen in all of these diseases refers only to a "gross" picture, for each disease may have a fibrinoid change due to a different chemical material. In disseminated lupus this substance is now believed derived from deoxyribose nucleic acid. It has been demonstrated that neither fibrinoid degeneration nor necrotizing arteritis are exclusively the products of hypersensitivity.

A Play-pen Pad That Trains Infants to Walk Correctly. M. H. Herzmark. Brit. J. Phys. Med. 17:150 (July) 1954.

According to the American Foot Care Institute nearly 80 per cent of the youngsters aged 5 to 18 years are plagued by foot ills. During World Wars I and II, the disability suffered most by recruits was related to weak painful flat feet.

Flat feet are acquired by standing on a smooth, hard, flat surface. The young child in order to help balance himself broadens his base in standing by spreading his feet apart and adds more base by turning his feet out. This throws the weight of the body onto the inner side of the feet. Such a stance depresses the longitudinal arches, pronates the feet and everts the heels. The feet are brought closer together as muscles of the child grow stronger, but walking on a flat surface does not strengthen the muscles of the legs and the intrinsic muscles of the feet. Therefore a habit pattern of walking with feet pronated and heels everted is established. Of course, some children engage in athletics which develop the foot muscles.

Primitive peoples are observed to have strong feet. The graceful gait of the early American Indians has become a model for present-day athletes and cross-country walkers. The Indian babies learned to walk on uneven ground which required constant adjustment by different sets of muscles and supposedly raised the arches to span debris and reduced discomfort to the sole of the foot. On the basis of this supposition a play-pen pad of uneven surface is recommended to stimulate the resiliency and irregularity of natural ground and so promote proper elevation of the arch.

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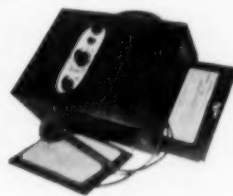
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BOOK REVIEWS

The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Society of Physical Medicine and Rehabilitation.

LABORATORY EXPERIMENTS IN PHYSIOLOGY. By *W. D. Zoethout*, Ph.D. Fifth edition. Cloth. Price, \$3.50. Pp. 260, with 96 illustrations. The C. V. Mosby Co., 3207 Washington Blvd. St. Louis 3, 1954.

This is a revised edition of a well-known laboratory manual in which some 217 specific experiments are described. This volume offers much in the way of technical information concerning fundamental and classical experiments in physiology. There is a minimum of theoretical material. Each experiment is clearly described by the use of staccato-like directions. Questions and terse explanatory descriptions are interspersed wherever they appear to be indicated. Part II generally not included in a course in physiology, appears to be more properly a part of biochemistry.

As an aid in the laboratory indoctrination for the student in classical physiology, this book would serve very well. There is much more material available than can be given in the usual course. This permits the instructor considerable latitude in the selection of the experimental sequence.

This volume is recommended for all students and educators interested in the field of physiology. It will have very little to offer the advanced student of physiology. It is not particularly designed to be adapted to the routine medical program in physiology, although much of the volume would be of value if used in a medical physiology course.

FUNDAMENTALS OF NEUROPATHOLOGY. By *William Brooks Dublin*, M.D. Cloth. Price, \$18.50. Pp. 685, with 329 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad St., Oxford, England; Ryerson Press, 299 Queen St. W., Toronto, 2B, 1954.

On reading this new text, one is immediately impressed with its attractive presentation.

The contents are divided into chapters discussing changes in the nervous system secondary to well established etiologic agents in general pathology such as, infections, trauma,

degeneration, tumors and metabolic disturbances.

Although clinical pathological correlations are adequate the emphasis is not on classification according to neurological clinical syndromes.

The text is sufficiently documented with selected references which are available to students as needed.

This is considered a worthy addition to standard medical texts in this field and one of interest to those studying in Physical Medicine and Rehabilitation as the pathology of the nervous system is of fundamental importance to the specialist in this field.

CORONARY HEART DISEASE IN YOUNG ADULTS: A MULTIDISCIPLINARY STUDY. By *Menard M. Gertler*, M.D., and *Paul D. White*, M.D. Cloth. Price, \$5.00. Pp. 218, with illustrations. Published for Commonwealth Fund by Harvard University Press, Cambridge 38, Mass.; Oxford University Press, Amen House, Warwick Sq. London, E.C.4, 1954.

In 1937, Glendy, Levine and White published a report briefly analyzing 100 patients under the age of forty who had coronary heart disease. This study is a continuation of this analysis. The patients selected had to fulfill certain criteria, and had to have a history of myocardial infarction at least six months earlier. These were compared with "controls" which closely match these patients. All these patients tended to be stocky, to have high blood concentrations of cholesterol and uric acid and to produce peculiar saliva. They were not obese. Their metabolism was about normal, and they did not have excessive intake of dietary cholesterol.

The authors conclude that coronary heart disease is caused not by one etiological agent, but by many factors. It is hoped that by this a similar method of study, it may be possible to select individuals prone to develop coronary disease and institute some form of preventive therapy to delay the episode of coronary attack.

THE PHYSIOLOGY OF MAN. By *L. L. Langley, Ph.D., and E. Cherashin, M.D.* Cloth. Price, \$5.50. Pp. 609, with illustrations. McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 36, 1954.

This book is written as a general physiology text for elementary courses. The authors have deviated from the usual type of presentation in several ways. The basic presentation of material is as dogmatic fact with some but often not enough supporting evidence, and disregard of other scientific data which do not fit the dogma propounded. On many subjects the treatment is superficial to the extent that it is almost meaningless in terms of our present knowledge.

The authors have tried to use the technic of "striking advertisements" in use of cartoons to illustrate physiological principles, and to capture the reader's interest. In some cases they have succeeded. In far too many cases, the striking aspect of the cartoon is not related to the physiological story to be told and while the illustration may be eye-catching, it diverts the reader from the context of the book.

It does not appear that this is as satisfactory a text for an elementary physiology course as a number of other texts now available.

THE FUNDAMENTALS OF X-RAY AND RADIUM PHYSICS. By *Joseph Selman, M.D.* Cloth. Price, \$8.50. Pp. 340, with 174 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, 49 Broad St., Oxford, England; Ryerson Press, 299 Queen St., W., Toronto 2B, 1954.

This book is the product of lectures given for a number of years by the director of the School for X-Ray Technicians at Tyler Junior College in Tyler, Texas. It is well written, simple and concise. Mathematics are almost entirely omitted with the exception of a few formulae of fundamental significance and an introductory chapter on elementary algebra and geometry. A large number of good line drawings and numerous tables supplement the written text. Despite its generally elementary character, the book contains a fine chapter on the structure of matter and even presents a brief discussion of Planck's quantum constant theory. It lies in the nature of this particular book that by far the larger part is devoted to the physics of x-ray diagnosis rather than to x-ray therapy. Discussions of x-ray and radium dosage, for example, cover only about two pages each. The book can be highly recommended not only to x-ray technicians but also to residents in radiology.

THE DYNAMICS OF VIRUS AND RICKETTSIAL INFECTIONS. By *Frank W. Hartman, M.D.; Frank L. Horsfall, Jr., M.D., and John G. Kidd, M.D.* Cloth. Price, \$7.50. Pp. 460. McGraw-Hill Book Company, Inc., Blakiston Division, 330 W. 42nd St., New York 36, 1954.

This very interesting volume contains discussions by international experts of a field far removed from Physical Medicine and Rehabilitation. It should be of great value to those involved in the care of infectious diseases. The mechanisms of immunity in poliomyelitis is a chapter of great actuality. Other sections discuss mechanisms of virus and rickettsial infections including the influenza virus. The ecology and pathogenesis as well as laboratory diagnosis of these infections is outlined. The last but very important part deals with prophylaxis and treatment of virus and rickettsial infections which includes antimetabolites and antibiotics.

SURGICAL TECHNIGRAMS. By *F. M. Al Akl, M.D.* Cloth. Price, \$12.00. Pp. 346, with illustrations. McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36, 1954.

The author has selected thirty-six common major surgical procedures for presentation. Each operative procedure is illustrated by sequential clear diagrams. Added to these well known "Surgical Technigrams" is a basic anatomical drawing, and an epitomized commentary on the technic, both succinctly clear and well done. The volume will serve well for consultation and brief review of any given operative procedure.

REVIEW OF PHYSIOLOGICAL CHEMISTRY. By *Harold A. Harper, Ph.D.* Fourth edition. Boards. Price, \$4.00. Pp. 329, with illustrations. Lange Medical Publications, University Medical Publishers, P. O. Box 1215, Los Altos, Calif.; Spanish edition, Ediciones Morata, Apartado 4041, Madrid, 1953.

This book, as the title implies, is a review of the entire field of physiological chemistry. The author has attempted to cover the entire subject and has done it very well. The book is well written, understandable and clear. The coverage of each subject, although relatively brief, is adequate and accurate.

The material ranges from a review of the basic physical and organic chemistry through metabolism and nutrition. The illustrations, charts and tables supplement and further clarify the text.

The book can be highly recommended as a desk reference for all physicians, since the information is both easily accessible and understandable with a minimum of irrelevant material.

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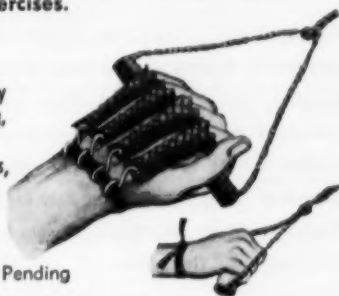
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